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A TREATISE

ON THE

STRUCTURE, ECONOMY, AND DISEASES

OF THE

LIVER;

TOGETHER WITH

AN ENQUIRY

INTO THE

PROPERTIES AND COMPONENT PARTS

OF THE

BILE AND BILIARY CONCRETIONS:

BEING THE SUBSTANCE OF THE GULSTONIAN LECTURES
READ AT THE COLLEGE OF PHYSICIANS
IN THE YEAR 1792.

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TO THE

PRESIDENT AND FELLOWS

OF

THE COLLEGE OF PHYSICIANS,

THIS TREATISE

IS VERY RESPECTFULLY INSCRIBED,

BY THEIR MOST OBEDIENT SERVANT,

WILLIAM SAUNDERS.

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INTRODUCTION.

In moſt animals to which Nature has given a regular circulation of blood, ſhe has likewiſe annexed certain organs as appendages, whoſe function is that either of ſeparating from it certain parts which apparently pre-exiſted in the general maſs, or of creating from it new fluids different in all their properties from the blood itſelf.—The fluids thus formed are called ſecretions, and perform a very extenſive office in the œconomy of moſt animals.

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The advantages which an animal machine derives from the ſecreted fluids are as various as their deſtinations; ſometimes the general ſyſtem is benefited by the mere act of getting rid of the offenſive or ſuperfluous fluid, as the exhalation from the lungs, perſpirable matter, urine, and the like; at others a fluid is formed to anſwer a temporary purpoſe, which being effected, the fluid is returned into the general maſs. Of this kind inſtances may be found in the interſtitial fluids, which preſerve the pliability or mobility of one part upon another, as in the ſynovia of the joints, &c.

A third deſcription of ſecretion is that where the fluid aſſiſts the vital organs in the performance of their true and vital actions; under this claſs we may remark the biliary ſecretions; the importance of which to the animal œconomy can be only truly and well underſtood, by conſidering the miſchiefs that enſue from the ſuſpenſion of this ſecretion, or the diſeaſes of the organ by which it is formed.

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CHAP. I.

ANATOMICAL DESCRIPTION OF THE LIVER.

SECT. I.

To the ſecretion of the bile Nature has deſtined an organ of conſiderable ſize called the liver; its magnitude is greater than that of any gland in the body, ſo that it occupies a very conſiderable part of the abdominal cavity.

2. Its figure is ſomewhat irregular, conſequently it does not readily admit of

any compariſon with any mathematical figure, nor with any body with which we are acquainted. This circumſtance of the liver is perhaps leſs eſſential than many others, as figure does not appear to throw any light on its œconomy. At leaſt we naturally incline to this opinion, from taking a view of this viſcus in different animals, when it appears that the external figure of the liver is determined by the figure of the animal itſelf, or that particular cavity in which it is contained. In the human ſubject it is ſometimes flattiſh and convex in its anterior ſurface, irregular in its poſterior, having ſeveral depreſſions; at its inferior edge there is a fiſſure extending ſome way up, particularly in its poſterior ſurface, which forms a diviſion into two lobes of unequal ſizes. Theſe, from their ſituation in the abdo-

cox

minal cavity, are diſtinguiſhed by the names of right and left, of which the right is the largeſt. Beſides theſe, there is a ſmaller lobe, ſituated at the ſuperior and poſterior part, called Lobulus Spigelii.

3. THOUGH in adult ſubjects the right lobe is larger than the left, in the fœtus the left is as large as the right. This variety depends on the diſpoſition of the umbilical vein in the fœtus with reſpect to this organ, for on its arrival at that gland, it ſends off ſeveral branches to it, ſome of which penetrating the left lobe are of conſiderable ſize, but after birth, when the circulation takes a new courſe, the whole liver diminiſhes in its bulk, but more eſpecially its left lobe.

4. BESIDES this variety in the proportion of its lobes, the whole fœtal liver muſt neceſſarily exceed that of the

adult; for in addition to the veſſels proper to the liver and neceſſary to its œconomy, there is one peculiar to the fœtus, (viz.) the umbilical vein. This veſſel, which has its origin in the placenta, accompanies the other veſſels of the cord and perforates the navel; thence having reached the inferior edge of the liver, it paſſes along the fiſſure which ſeparates the lobes, and having entered its ſubſtance it ſends off ſeveral branches; thoſe going to the left lobe are larger and more in number than thoſe to the right. After which the umbilical vein divides into two branches, one taking the courſe of the vena cava, called canalis venoſus, the other uniting with the branch of the vena portarum, pours its blood into that ſyſtem, ſo that by much the largeſt proportion of the blood circulating between the fœtus and the placenta, paſſes through the liver, and this ſufficiently explains why the fœtal liver exceeds in proportion that of the adult.

5. THIS organ is ſituated in the ſuperior part of the abdomen, principally on the right ſide, occupying the right hypochondric and epigaſtric regions, and ſometimes extends into the left hypochondrium. Its preciſe ſituation cannot be eaſily determined, as the inferior part of the cheſt admits of conſiderable variety both in its figure and capacity. In males, where there is a greater capacity of cheſt, the hypochondria are more capacious, hence the right hypochondric and epigaſtric regions are large enough to contain this viſcus.

6. IN Females, having naturally a ſmaller cheſt, and ſtill more contracted by tight lacing, the right hypochondric and epigaſtric regions are inſufficient to

contain the liver, it therefore extends far into the left hypochondrium; beſides which, it ſometimes, in theſe caſes, occupies no inconſiderable part of the umbilical region. Its ſituation, then, with reſpect to the general cavity of the abdomen, admits of ſome variety. In the fœtus, it occupies the whole epigaſtric region, and both the hypochondria; not ſo much from any peculiarity in the figure of the upper part of the abdomen, as from a difference in the proportion of the right and left lobe, which has already been noticed.

7. THOUGH the ſituation and extent of the liver in the general cavity of the abdomen admit of ſome variety, yet its poſition with reſpect to the diaphragm is rather preciſe, being connected to it by doublings of the peritonæum, called ligaments.

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8. This viſcus, in common with the others of this cavity, receives a covering from the peritonæum, which, doubling upon itſelf, and quitting the parenchymatous ſubſtance of this organ, is attached to the diaphragm. This connection obtaining in certain parts, forms the ligaments. The moſt conſpicuous of which is, that ſituated at its anterior part, in a line correſponding to the fiſſure, forming the diſtinction between the right and left lobe, which, extending from the ſuperior to the inferior edge in a ſcythe-like ſhape, is called by ſome the FALCIFORM ligament; others, from the function it performs, call it the SUSPENSORY ligament.

9. The lateral portions of the liver are connected in like manner to the correſponding parts of the diaphragm, taking the name of lateral ligaments. Be-

ſides which, ſome anatomiſts reckon the portion of peritonæum ſurrounding the veſſels, which paſs from this viſcus through the diaphragm, as a fourth ligament, and call it the coronary ligament.

By theſe different reflections of the peritonæum, the liver is ſupported in its ſituation.

10. But there is yet another part, uſually numbered with the ligaments, which, however, performs no ligamentory function, viz. the ligamentum rotundum*. This paſſes from the concave part of the liver along its longitudinal fiſſure, and is continued to the umbilicus.

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* The ligamentum rotundum has already been noticed under the name of umbilical vein, of which it is to be conſidered as the collapſed remains: for after the circulation through this has ceaſed, which neceſſarily happens at birth, its cavity diminiſhes, and in time becomes nearly obliterated.

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11. Hence in the living ſubject the ſituation of the liver muſt vary, with reſpect to the general cavity, according as the diaphragm deſcends or aſcends, in the acts of inſpiration or expiration.

12. The ſituation of the ſtomach with reſpect to this organ is ſuch, that the right portion of the former is frequently covered by the left lobe of the latter, and from the bilious tinge frequently found on the external ſurface of the duodenum near the pylorus, it appears that the gall-bladder uſually reſts on this part.

13. The gall bladder is a bag ſomewhat pyriform in its ſhape, its neck or ſmall extremity being ſituated ſuperiorly, its fundus, or large extremity, being ſituated inferiorly. It is lodged in a depreſſion on the concave ſurface of the right lobe of the liver, to which it is

attached by a continuation of the peritonæal coat of that viſcus over its ſurface. It varies ſomewhat in ſize according to the degree of diſtention which it ſuffers, but in moſt inſtances the fundus projects a ſmall diſtance below the inferior edge of the liver. Deſtined by Nature to contain bile, it has a duct which both receives and diſcharges it, the œconomy of which will be conſidered hereafter.

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CHAP. II.

VESSELS OF THE LIVER.

SECT. I.

Every organ deſtined by Nature to ſecrete a fluid, is very plentifully furniſhed with blood. The neceſſity of this is evident; for it requires, not only a ſupply of that fluid for the purpoſe of its nouriſhment, and which it poſſeſſes in common with every other organized part, but an additional quantity is alſo expedient to enable it to perform its ſecretory functions; as it is from the blood that all the ſecretions are derived.

SUCH is the œconomy of Nature in glandular bodies in general, that the ſame fluid which is fit for the nouriſhment of the gland, is adapted alſo to its ſecretory office, and is conveyed to the organ by the ſame veſſel. But the phyſiologiſt is unable to aſcertain, with any degree of preciſion, what proportion of blood is allotted to nutrition, and how much to ſecretion.

2. OUR knowledge of the œconomy of Nature in this reſpect, receives ſome light from a peculiarity which obtains in the liver, and which diſtinguiſhes it in a very ſtriking manner from every other gland in the body. For while the functions of nutrition and ſecretion are in them combined in the ſame veſſel, in this organ theſe offices are kept

apart, and performed by different veſſels. Therefore, by a judicious compariſon of the area of the nutriment with that of the ſecreting veſſel, we may readily allot to each its due proportion.—But this idea will be farther purſued hereafter.

3. BLOOD of every deſcription is not equally fit for nutrition: that only, which has received the change from reſpiration, and which circulates through the arteries, is well adapted to this purpoſe, therefore the liver receives its nutrimental blood from an artery.

4. THE rule which ſeems to guide the conduct of Nature in the origin of veſſels ſupplying other organs, obtains equally in this, as the hepatic artery ariſes from the neareſt conſiderable trunk.—The following is the mode of its origin.

5. THE Aorta, while it is paſſing be-

tween the crura of the diaphragm, ſends off from its anterior part three conſiderable azygos trunks: the firſt takes the name of cœliac artery; the ſecond, which is almoſt immediately under the former, is called the ſuperior meſenteric; and the third, going off from the aorta at ſome diſtance from the laſt veſſel, is named inferior meſenteric artery: the two laſt ſupply the inteſtinal canal.

6. The cœliac trunk ſoon divides into three branches—the firſt, being diſtributed to the leſſer curvature of the ſtomach, is the coronary artery; the ſecond, paſſing to the left, is called the ſplenic artery; and the third, or largeſt, whoſe office we are now to conſider, takes the name of hepatic artery.

7. The hepatic artery at its origin is a veſſel of conſiderable ſize, but before

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it arrives at the liver is ſenſibly ſmaller; the cauſe of which is, that in its progreſs it ſupplies adjacent parts with blood, viz. the right portion of the ſtomach by means of the gaſtrica dextra and pylorica, and the gall bladder by the arteria cyſtica; therefore in forming a true eſtimate of the quantity of blood ſent to the liver for its nouriſhment, we are to conſider the area of the hepatic artery after the three preceding branches are ſent off.

8. THIS veſſel, agreeably to the general law of diſtribution, divides into branches before it enters the ſubſtance of the liver; its ramifications then multiply and extend, with great minuteneſs, through the whole maſs, ſo that in every part of its ſubſtance there is circulating blood poſſeſſed of properties fit for nutrition. But as this blood is in a

ſtate of conſtant motion, and is continually changing by ſucceſſive ſupplies, a redundancy is prevented here, as well as in other parts of the body, by returning veins. The ultimate branches then of the hepatic artery terminate in the hepatic veins, and theſe return the blood into the vena cava inferior, by three or four venous trunks. Such is the circulation through the liver as connected with its nouriſhment. We are next to conſider it as an organ of ſecretion.

9. THIS organ differs from every other gland of the body with regard to the nature of the blood from which ſecretion is performed. While other fluids are ſecreted from florid arterial blood, which has lately received changes from the air by the intervention of the lungs, the bile is formed from blood of a dark colour, poſſeſſing the common charac-

cox

ters of venous blood, and is conveyed to the liver by a vein.

10. The vena portarum, which conveys this blood, takes its name from the part of the liver at which it enters, there being two eminences, one on each ſide of the fiſſure, called the portæ, where this veſſel begins to penetrate its ſubſtance. To underſtand the origin of the vena portarum, and the properties of the blood which it conveys, it will be neceſſary to explain the circulation through the chylopoietic organs. The branches of the cœliac, and meſenteric arteries, as we have before obſerved, diſtribute their contents to the ſtomach, inteſtines, pancreas, and ſpleen, beſides the hepatic artery, which ſupplies the liver. The blood circulating through all theſe viſcera, except the laſt, being returned by their reſpective veins, is

poured into their common trunk, the vena portarum: thus the origin of the vena portarum appears to conſiſt in the concurrence of all the veins of the peritonæal viſcera except the liver.

11. As the function of this vein differs from that of other organs, it has been ſuppoſed to poſſeſs ſome peculiarities of ſtructure.—Some have thought it more muſcular than other veins, and that its characters approached nearer to thoſe of an artery. It certainly does not poſſeſs the grand diſcriminating mark of an artery, or the power of preſerving its orifice circular when divided tranſverſly. If it differs from veins in general, it is in having thicker tunics in proportion to the capacity of its canal; but with reſpect to the arrangement and diſpoſition of its muſcular fibres, this part of its ſtructure does not appear

cox

ſufficiently defined to authorize us to ſpeak with preciſion.

22. Glisson, whoſe opinion on this ſubject is not always quoted with approbation, conceived its grand characteriſtic to conſiſt in a continuation of that duplicature of the peritonæum ſurrounding the veſſels going to the liver, in the manner of a capſula, and to which it is uſual to annex his name.

He conceived likewiſe, that it not only enveloped the trunk of this vein, but accompanied it in all its ramifications through the liver; ſo that if a ſection were made into this organ, the branches of the vena portarum would be diſtinguiſhed from thoſe of other veſſels by the preſence of this adventitious tunic.

13. For this membrane, which the imagination had formed, fancy ſoon

ſuggeſted a uſe—Miſtaken obſervation had led him to believe that it poſſeſſed muſcular properties, and that it propelled with force the blood, whoſe motion would otherwiſe have been languid. The inveſtigations of other anatomiſts have not confirmed this opinion. They have diſproved the continuation of this peritonæal capſula beyond the trunk of the vena portarum, and have demonſtrated that it does not envelop the vena portarum in a particular manner, but only inveſts it in common with other veſſels, and as ſoon as it has arrived at the liver it quits them altogether, and, by expanding itſelf over the ſubſtance of this gland, forms its tunic.

14. THE vena portarum having reached the liver at that part called the great fiſſure, forms one large trunk called the ſinus of the vena portarum, from which

cox

three principal branches uſually take their origin; theſe, by forming ſubordinate ramifications in a regular ſeries, at length arrive at their terminations.

15. THE extremities of theſe veſſels end in two ways: one with reſpect to the circulation of the blood; the other, as connected with their œconomy, as ſecreting veſſels. In the firſt point of view they inoſculate with branches of hepatic veins, and through that channel return to the inferior cava all that blood which is not employed in the buſineſs of ſecretion. So that the hepatic veins are the common recipients of the contents of the hepatic artery, and likewiſe thoſe of the vena portarum.

16. THE ſecreting termination of this vein is in the beginnings of the hepatic ducts, called pori biliarii, and which in their origin muſt neceſſarily be very

minute, inſomuch as they preclude admiſſion to the red particles of the blood; from theſe minute beginnings they gradually enlarge by an union of branches, until at length they paſs out from the liver at its fiſſure, by two or three trunks, which ſoon after join together, and form the trunk of the hepatic duct.

17. THE ſtructure of this veſſel is apparently membranous, having no fibres which can be conſidered as muſcular, at leaſt as far as we can decide by ocular demonſtration. But, as the eye, even when aided by glaſſes, is not always competent to detect muſcularity, we are compelled to have recourſe to another and leſs fallacious teſt, which is the power of contraction on the application of a ſtimulus. Mechanical and chymical ſtimuli have been applied to this duct in a living animal, without

cox

producing any contraction which can be referred to muſcularity. Some chymical ſtimuli, it is true, will corrugate this canal, but they are ſuch as produce effects only by corroſion, and which they do as readily on inanimate as on living matter.

18. ANOTHER argument againſt their muſcularity is, that canals obviouſly muſcular, readily adapt their capacity to their contents. This law is very evident in the vaſcular ſyſtem. But when a biliary duct has been dilated by the paſſage of a gall ſtone, it does not very ſoon return to its primitive dimenſions. And, perhaps, thoſe painful affections of theſe parts, which have been very commonly conſidered ſpaſmodic, may find a more adequate explanation in the paſſage of a calculus.

19. IF the internal ſurface of this

ſyſtem of veſſels be examined, it will be found moderately vaſcular, as there is an appearance like follicles in many parts; hence it is probable, that it ſecretes a mucous kind of fluid.

20. Besides the veſſels already deſcribed, the liver is very plentifully ſupplied with abſorbents, which take their origin from every part of its ſubſtance, but more eſpecially from the branches of the hepatic duct. The proof of this origin will be reſerved until we treat of the œconomy of this organ. From the interior part the abſorbents purſue the direction of the ſurface, ſome ramifying on the anterior and ſome on the poſterior ſurface: their diſpoſition while on theſe parts is arboreſcent; thoſe on the convex ſurface incline towards the direction of the falciform ligament upon which they paſs, and ex-

tending their courſe in the direction of the diaphragm, terminate in the thoracic duct near to that part. Thoſe which ramify on the concave ſurface, form by a ſeries of junctions a common trunk, which paſſing from the liver in the direction of the hepatic artery, and with it and the other veſſels being incloſed in Gliſſon's capſula, terminate in the thoracic duct near the receptaculum chyli.

21. THESE two ſets of abſorbents, while ramifying within the liver, have free communication with each other, as may be proved by injection with mercury. —From a ſuperficial abſorbent on the convex ſurface, mercury will ſometimes penetrate the ſubſtance, and thence pervade thoſe on the concave ſide, from which the thoracic duct may be filled.

22. THESE veſſels poſſeſs the ſame character while in this organ as they do

in other parts of the body; that is to ſay, they are valvular. But, notwithſtanding this, they may be injected in a direction contrary to that in which their contents move. This, though apparently a paradox, is ſtrictly conſonant to reaſon and fact; for the function of the valves here is leſs complete than in ſome other parts of this ſyſtem, ſo that by preſſure mercury may take a retrograde courſe in the ſame veſſel.—Another reaſon is, that as the lateral communicating veſſels exceed the valves in number, a cluſter of abſorbents may be injected by a courſe in part retrograde and in part circuitous. It is in this way an injection may be made to paſs through the branches of the ſpermatic vein in a direction contrary to the natural circulation, yet thoſe veſſels are plentifully furniſhed with valves.

cox

23. Besides veſſels, the liver is furniſhed with nerves, though not very plentifully. The par vagum and intercoſtal nerves, while in the cavity of the thorax, communicate by branches with each other. Near to this part of junction ſeveral branches are ſent off, ſome of which are diſtributed to parts contiguous, others to more diſtant organs. But there is detached from each ſide a branch more conſpicuous than the others, viz. the ſplanchnic nerves, both of which, having pierced the diaphragm, unite.

24. At the part of union there is formed a ganglion, which, from its creſcent-like figure, is called ſemilunar. From this ganglion a multiplicity of nervous filaments are paſſing off in various directions, which, intermixing and obſerving a radiated courſe, form

the ſolar plexus. From this ſeveral ſubordinate plexuſes are detached, which receive names from the parts they ſupply; hence the names of ſtomachic plexus, ſplenic plexus, &c.—But from its right portion ſeveral ſmall nervous filaments paſs, which, ſurrounding the hepatic artery, accompany it to the liver, and take the name of hepatic plexus.

CHAP. III.

THE NATURE OF THE BLOOD CIRCULATING THROUGH THE VENA PORTARUM CONSIDERED.

SECT. I.

HAVING given a general deſcription of the veſſels ſupplying the liver, we are led to examine into the nature of the contents; and here we may remark, that it is very deſirable, but at the ſame time extremely difficult, to aſcertain the peculiar characters of the blood after circulating through each of the chylopoietic viſcera, previouſly to its paſſage into the liver, by the vena portarum; and to determine why it ſeems better adapted to the ſecretion of bile than common arterial blood, from which other ſecretions are ſupplied.

2. THAT venous blood is more favorable to this ſecretion than arterial, is very evident; this exception of the liver to Nature's law, in the œconomy of other glands, may be admitted as a proof. But the peculiar changes induced upon the blood, after circulating through the ſtomach and ſecreting the gaſtric fluid; after penetrating the pancreas, and there ſeparating the pancreatic juice; after pervading the inteſtines, where it not only ſecerns the inteſtinal mucus, but from its vicinity to fæculent matter may receive putreſcent properties, is at pre-

cox

ſent, and may perhaps continue long to afford an ample field of ſpeculation and conjecture.

3. The power of the ſpleen in this reſpect has been particularly acknowledged and inſiſted upon; inſomuch that modern phyſiologiſts have conſidered this as its only function. That the ſpleen, in common with the other viſcera, may contribute ſomewhat to change the properties of the circulating blood, ought not to be denied, but whether this be the principal and only end of its function, I think cannot be too carefully inveſtigated.

4. The number and rank of thoſe phyſiologiſts, who have conſidered the ſpleen as an auxiliary organ to the liver, are too reſpectable to be oppoſed on any ground except that of experiment and induction.

When opinion is oppoſed to opinion, and no reaſons adduced on either ſide in ſupport of each, whatever difference there may happen to be in the credit or authority of their reſpective promulgators, the opinions themſelves ſtand on equal ground. It is the reaſons then which ſtamp the true value of any opinion, and to them only we ſhall direct our inveſtigation.

5. FIRST, "*The blood which has circulated through the ſpleen, and which is returned from that viſcus by the ſplenic vein, is poured into the vena portarum.*"

6. THE poſition is unqueſtionably true, and merits conſideration; yet its proper influence on the mind, when conſidered as proof, ought to be duly weighed: for when we recollect that this circumſtance in the ſpleen is not a peculiarity in that organ, but one which

obtains in every peritoneal *viſcus*, except the liver, it muſt be evident, that, as far as this argument alone has force, the poſition falls infinitely ſhort of proof, and that the ſpleen adminiſters to the office of the liver only in the ſame proportion as the contiguous *viſcera*. This idea then appears to owe its birth more to our ignorance of the real uſe of that organ, than to any force in the cauſe juſt aſſigned.

7. SECOND, "*The blood in its courſe through the ſpleen, receives changes which enable it the better to concur with the liver in the ſecretion of bile.*"

The changes aſcribed are, a greater degree of fluidity, and a putreſcent tendency.

8. BARON HALLER was of opinion, that the blood returned by the epiploic and meſenteric veins, contained a large

portion of adipoſe matter, which it received by the abſorbent power of thoſe veins, and which imparted to it ſo great a degree of viſcidity, that without the diluting power of the ſplenic blood, which mixes with it when entering the *vena portarum*, it would be liable to concrete.

9. THERE is little probability in this opinion, whether we conſider the power of the epiploic veins as abſorbing fat from the *omentum*, or the function of the ſpleen as an organ performing dilution.

Abſorption by red veins has ſo few advocates in the preſent day, that it were ſuperfluous to adduce either argument or experiment by way of refutation. But waving that controverſy, let us inquire how far the ſpleen acting on its blood as a diluting organ, can be ſupported by facts.

cox

EXPERIMENT.

10. THE *abdomen* of a living dog being opened, and the ſpleen with its veſſels being drawn gently out, blood was taken both from the artery and vein, and received into cups of ſimilar ſhape and equal ſize. On weighing ſuch, there was found to be 420 grains of arterial, and 468 of venous blood. Both coagulated in leſs than two minutes, and in about the uſual time they ſeparated into *ſerum* and *craſſamentum*. In twenty-four hours, the *ſerum* of both was accurately weighed: the 420 grains of blood from the ſplenic artery ſeparated 191 grains of *ſerum*; the 468 grains from the vein ſeparated 213 grains.

11. BUT our conceptions of this matter will be much aſſiſted by inſtituting a

compariſon with one common ſtandard, ſtill preſerving the *ratio*.

Therefore we ſay, 1000 parts of blood from the ſplenic artery ſeparated 454, while the ſame quantity from the vein yielded 455: a difference ſo inconſiderable as this ſurely can never be laid hold of as a proof that the ſpleen is ſubſervient to the liver, on the principle of a diluting organ.

But to purſue the inquiry ſtill further, I thought it of importance to examine the fluidity of the *ſerum*.

EXPERIMENT.

12. EQUAL portions of each *ſerum* were expoſed nearly to the ſame degree of heat, until coagulation had taken place. Upon preſſing the ſurface of each, there exuded at different points

cox

ſmall particles of a watery fluid, which Senac calls the ſeroſity of the blood; and upon examining the proportions of each, I could not diſcover any difference. Therefore, if we admit that the liver receives any aſſiſtance from the ſpleen, it does not appear to owe any thing to that organ on the principle of dilution.

13. THE other change, ſuppoſed to be induced on the blood by its circulation through the ſpleen, is a putreſcent tendency; this has been conjectured in part from its contiguity to the *colon*, and in part from the languid ſtate of the circulation through that *viſcus*.

Without inſtituting any ſerious inquiries into the probable weight of theſe reaſons, and their ſufficiency to ſupport the propoſition, let us inquire into the fact itſelf.

EXPERIMENT.

14. Two portions of blood, one taken from the ſplenic artery, the other from the vein, were expoſed for four hours to a heat upwards of 90 degrees; but neither of them betrayed the ſmalleſt marks of putreſcency.

This opinion appears to have originated in an erroneous idea concerning the properties of the bile, which ſome have conſidered as the moſt putreſcent fluid of the body; but with extreme impropriety, as experiments have fully evinced.

15. Thus far our inquiries have favoured very little the connection between the ſpleen and the liver. But in order that the refutation may be more complete, it is neceſſary that a compa-

cox

riſon be made between bile taken from an animal whoſe ſpleen has been previouſly removed, and one in which that *viſcus* is ſtill remaining.

EXPERIMENT.

16. THE ſpleen of a dog was removed, and the wound healed up in a few days. He was kept ſeveral weeks afterwards, during which time he ran about the houſe like any other dog. Another dog in perfect health being procured, both were ſtrangled, and the bile contained in the gall bladder of each collected in ſeparate veſſels for the purpoſe of compariſon.

17. THE colour of both, which was that of a bottle green, correſponded very exactly.

There was no difference in tenacity;

in both it was juſt ſufficient to prevent its falling from a phial in drops.

The taſte of each was intenſely bitter, and ſlightly pungent.

No perceivable difference in ſmell.

Portions of each being mixed with *litmus*, turmerick, and ſyrup of violets, betrayed no difference of colour.

Equal portions of each of theſe ſpecimens of bile, being mixed with equal portions of concentrated vitriolic acid, a brown colour was produced; and with a very diluted vitriolic acid, a ſtraw colour.

With concentrated nitrous acid both effervеſced, and exhibited a brown colour.

With alkohol there was a flocculent appearance. Evaporation to a thick extract left a *reſiduum*, which was highly inflammable.

18. THE reſult of theſe experiments

cox

makes it highly probable, that the bile ſecreted after the loſs of the ſpleen, differs in no reſpect from other bile; and that the liver in the exerciſe of its function is perfectly independent on that viſcus.

19 THUS we ſee an opinion, which has received a degree of currency from the ſanction of men of eminence, loſes its importance, when examined by the teſt of experiment; and a patient inveſtigation of Nature's operations on this plan, muſt ever prevail over authority or prejudice.

20. IT has been aſſerted above, that venous blood is the proper ſource of the biliary ſecretion, and that, notwithſtanding ſome additional properties may be ſuppoſed to be imparted to it during its circulation through the peritonæal *viſcera*, neither experiment nor obſerva-

tion have contributed any thing concluſive in favour of ſuch opinion.

21. THE peculiar œconomy of the biliary organ in the *fœtus*, is particularly deſerving our conſideration, as the blood from which the ſecreted fluid is made, cannot be conſidered as ſtrictly venous, but partaking in ſome meaſure of the arterial character; and this intermediate condition of blood appears to produce a correſpondent ſtate of the bile: for it is matter of notoriety that fœtal bile is leſs active and concentrated, abounding more in the watery principle than that of the adult. This being granted, it neceſſarily follows, that whatever changes are induced on the blood in paſſing from the arterial to the venous condition, thoſe changes furniſh the principles which adapt the blood more completely to this purpoſe. But as phyſiologiſts are

cox

not agreed reſpecting the eſſential difference of arterial and venous blood, what properties the one poſſeſſes of which the other is deſtitute, any reaſoning inſtituted on ſuch an uncertain baſis muſt neceſſarily be unmeaning and inconcluſive.

22. But to revert to the œconomy of the liver in the *fœtus*, it may be obſerved, that beſides the blood which is ſent to it by the hepatic artery and *vena portarum*, it receives a large portion by the umbilical vein.

23. To underſtand this we ſhould advert to ſome of the peculiarities of the *fœtus in utero*. It is very generally admitted, that the *placenta* is to the *fœtus* what the lungs are after birth; that by both a change is induced on the blood, by which it loſes the venous character and aſſumes the arterial one, in ſuch

proportion as the exigencies of each may require. As ſoon as the change is wrought in the blood of the *placenta*, it is conveyed by the umbilical vein to the liver of the *fœtus*; part of this blood mixes with the common blood of the *vena portarum*, and with it concurs in furniſhing the ſecretion of the bile; the remainder is carried into the *vena cava inferior* by the *canalis venoſus*.

24. IN the *fœtus*, then, it ſeems that the blood in the *vena portarum* has more of the arterial condition than that of the adult, and ſeems to produce a bile of leſs activity.

cox

CHAP. IV.

ON THE HEPATIC ARTERY, AND THE OFFICE OF THE BLOOD WHICH IT CONTAINS.

SECT. I.

By far the greater number of phyſiologiſts have agreed, that the hepatic artery carries blood to the liver for its nouriſhment, and that this is its only deſtination. There are a few, however, who incline to a different opinion; and contend that, in addition to this function, it concurs with the *vena portarum* in the ſecretion of the bile.

2. THE reaſons on which this opinion is founded, have at leaſt ſpeciouſneſs to recommend them; and in our inquiry into this queſtion, the merits of each will be carefully inveſtigated: and, at the ſame time that we conceive it our duty to detect and expoſe fallacy wherever it appears, it is no leſs congenial to our inclination to aſcribe to each argument its due and proper force.

3. THE firſt poſition advanced in favour of this opinion is, "That it is pro-
" bable that the office of the hepatic ar-
" tery is not confined to the nouriſh-
" ment of the liver, from the diſpropor-
" tion of its veſſels to the bronchial ar-
" teries, which nouriſh the lungs."

4. IN examining this argument we

find it is of an analogical nature; and conſequently, if well founded, cannot extend its force beyond preſumption or probability. But we muſt always keep in view the difference between an analogy which is cloſe, and where the points of coincidence are ſtriking and well marked; and one where they are but few, and thoſe not very evident. Even the firſt will always fall ſhort of proof, while the laſt can ſcarcely warrant ſo much as a conjecture.

Therefore the object which is held out as the analogy, cannot be too ſeverely ſcrutinized.

5. THIS argument, then, reſts on a preſumption, that the lungs, which are at leaſt as maſſy as the liver, are nouriſhed by the bronchial arteries, which are much leſs capacious than the hepatic artery; therefore it has been ſaid, if the

bronchial arteries are ſufficient to nouriſh the lungs, the hepatic artery ought to do ſomething more than nouriſh the liver; or, in other words, it ought to contribute ſomewhat to the ſecretion of bile.

6. THE inference would be natural and fair, provided it were firſt eſtabliſhed, that the bronchial arteries alone nouriſhed the lungs.

7. BEFORE the days of *Ruyſch*, phyſiologiſts imagined that the lungs were nouriſhed by the pulmonary artery; they were the more perſuaded of this, becauſe the exiſtence of any other veſſel going to the lungs had not been ſuſpected. But *Ruyſch*, by his art of injecting, diſcovered the bronchial arteries, and theſe he conſidered as their true nouriſhing veſſels; and what ſeemed to give ſtrength and confirmation to this opinion was, that the blood, while circu-

lating through the pulmonary arteries, poſſeſſes the venous character, and of courſe is unfit for nutrition; while that ſent by the arteries of *Ruyſch* is in every reſpect adapted to this end.

But the following arguments may be adduced, not only from ſpeculation, but from experiment, to prove that the ſubſtance of the lungs is nouriſhed by the blood in the extreme branches of the pulmonary artery; and that the bronchial arteries of *Ruyſch* are confined to the nouriſhment of the branches of the *bronchiæ* alone.

As the blood in the ſmaller branches of the pulmonary artery is expoſed to the influence of the air, it muſt neceſſarily receive a change, and aſſume the arterial character; in which ſtate it is as fit for nutrition as the blood circulating in other arteries.

We learn from obſervation and experiment, that when inflammation has occaſioned the ſurfaces of the *pleura* and lungs to cohere, ſuch adheſions become vaſcular, and may be injected by the pulmonary artery: and, as the blood diſtributed to theſe adheſions is for the purpoſe of their nouriſhment, their communication with the ultimate branches of the pulmonary artery proves inconteſtibly, that ſuch blood is fit and proper for the nouriſhment of the lungs.

Hence it appears, that there is not the leaſt analogy between the hepatic artery and the liver on the one hand, and the lungs and the bronchial artery on the other. Conſequently the argument, which reſted on this analogy, is not entitled to notice.

" Second argument in favour of the

“ hepatic artery aſſiſting in the ſecre-
“ tion of bile, is founded on an appa-
“ rent communication between the ul-
“ timate branches of thoſe veſſels and
“ the beginnings of the biliary ducts;
“ for, ſay the advocates for this doc-
“ trine, a ſubtile fluid may be injected
“ with eaſe from one ſet of veſſels to
“ the other.”

That the biliary ducts may be filled by a ſubtile fluid injected into the artery, we ſhall not deny; but this fact does by no means prove a direct communication between one ſet of veſſels and the other, as will very ſoon appear.

When we reflect on the circulation through the liver, it muſt be evident to us, that as the hepatic veins return blood both from the hepatic artery and the *vena portarum*; that the hepatic artery has communication with the latter by the intervention of the hepatic veins, and that a fluid injection thrown in by the artery will paſs very readily into the veins; where, if its *exit* be prevented by tying them up, it may regurgitate into the terminations of the *vena portarum*, and thence eſcape into the *pori biliarii*.

But leſt this explanation ſhould be objected to as being too circuitous, another offers itſelf much more direct, and admits of proof from injection.

Water injected by the hepatic duct paſſes with freedom into the hepatic veins; and again, a ſimilar fluid paſſes eaſily from the veins into the duct: hence a fluid injected by the artery paſſes firſt into the veins, and afterwards into the *pori biliarii*; ſo that the arguments founded on the phenomena reſulting from injections cannot be admitted as proofs, that the hepatic artery exerciſes a ſecretory function.

The capacity of the hepatic artery with relation to the bulk of the liver, has been the ground on which its ſubſerviency to the ſecretion of the bile has very much reſted, from an idea that it carried to the liver more blood than the mere purpoſes of nutrition required; hence it was imagined, that it either co-operated with the *vena portarum* in the immediate act of ſecretion, or that it ſeparated from the blood, circulating through its extreme branches, a fluid which formed one of the conſtituent parts of the bile.

But the capacity of the hepatic artery does not neceſſarily ſuppoſe either one or the other of theſe offices; for it is well known, that parts of the body, which are not ſecreting organs, are furniſhed with a larger proportion of arterial blood than the liver: of this kind are the muſcles, the brachial artery being larger with reſpect to the arm, than the hepatic artery is with reſpect to the liver.

Now muſcles, we know, are organs which occaſionally perform ſtrong and repeated actions, and, like other actions when long continued, tend to debilitate and exhauſt the machine; but when performed with moderation, they become invigorated and enlarged, and the increaſe of bulk which they acquire in this way, is principally owing to an increaſe in the capacity of their blood veſſels, as appears not only from the more florid colour of thoſe muſcles, but likewiſe from comparing the capacities of the trunks of the veſſels with the muſcles themſelves.

Tendons, on the contrary, though parts equally alive, yet, from their more paſſive condition, require a ſupply of blood ſufficient only for their nouriſhment.

The brain is an organ which, with relation to its bulk, receives a larger quantity of blood than any other part of the body, yet its function as a ſecreting organ is not obvious.

The inference intended to be drawn from theſe facts is, that parts, though not ſecretory, require a ſupply of blood in proportion to the actions they perform.

Now ſurely we cannot heſitate to admit that the exertion of a ſecreting organ neceſſarily implies a conſiderable ſupply of vital energy, as it conſiſts in changing the blood into a fluid different in all its properties from the blood itſelf, ſo that it may aſſume a new mode of exiſtence. In other glands arterial blood ſerves the double purpoſe of being the *pabulum* of the ſecretions, and of ſupplying the organ with vital energy ſufficient to effect its purpoſe; but in the liver, where the ſecretion is performed from venous blood, which is unfit for furniſhing it with vital energy, there the neceſſity for a copious quantity of arterial blood ſeems very evident*.

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* An extraordinary caſe of *Luſus Naturæ* has lately occurred to Mr. Abernethy, Teacher of Anatomy; in which the vena portarum had a ſingular termination. Inſtead of conveying its blood into the ſubſtance of the liver, prior to its termination in the inferior vena cava by the intervention of the hepatic veins, the blood returned by the veins of the different chylopoietic organs, was conveyed by the vena portarum immediately into the vena cava inſerior near to the origin of the emulgent veins. The hepatic artery, which appeared to be ſomewhat enlarged, was the only veſſel carrying blood to the liver, and in this individual inſtance it appeared to perform the double function of nutrition and ſecretion. That bile was ſe-

Admitting the *vena portarum* alone to be the ſecreting veſſel, and that the hepatic artery furniſhes blood only for imparting a due degree of energy, it ſtill remains a queſtion of what nature the communication between theſe two veſſels is. Perhaps here it may be more conſonant to the true ſpirit of phyſiology to content ourſelves with the fact, and trace its application to the œconomy of this organ, than to indulge ourſelves in framing viſionary hypotheſes, which exiſt only in the effloreſcence of fancy.

creted in this caſe, appears evident both from the preſence of it in the inteſtines and gall bladder. The latter, though of its uſual ſize, contained only a ſmall portion of this fluid, the properties of which were very ſimilar to thoſe of the bile in other young ſubjects. The ſubject of the preſent caſe was a child apparently about one year old, in every reſpect well nouriſhed.

CHAP. V.

INTERIOR STRUCTURE OF THE LIVER.

SECT. I.

It is from the blood circulating through the branches of the *vena portarum*, that bile is ſecreted; but in what particular part of this ſyſtem the change commences, and what is the preciſe ſtructure of parts adapted to this end, are fit ſubjects for inquiry.

2. It has been already obſerved, that the ultimate branches of the *vena por-*

tarum have a double termination; one of which is, with reſpect to the circulation of red blood, by the beginnings of the hepatic veins; the other, with reſpect to the immediate ſecreting veſſels, by the *pori biliarii.*

3. DOES the change commence in the ſmall branches of the *vena portarum* before they terminate in the hepatic veins?

4. THIS is ſcarcely probable; for any bilious properties, which the blood may have acquired at this part, would be loſt with reſpect to the hepatic duct, as it finds a more ready courſe through the hepatic veins: beſides which, the conſtitution would be in a continual ſtate of jaundice.

5. THE probability is, that there is no ſenſible alteration induced on the blood of the *vena portarum* before it termi-

nates in red veins. And as arteries terminate in veins by capillary veſſels, ſo, from the analogy which obtains between the *vena portarum* and an artery, we preſume that the ſame termination does not take place until the branches have become capillary.

6. It follows from this, that the true ſecreting veſſels are the very ultimate branches which communicate with the *pori biliarii.*

7. The next queſtion is, how far the ſecretion of bile is connected with any peculiar arrangement or ſtructure of theſe parts: or, in other words, whether the ſecreting veſſel communicates with the beginnings of the excretory duct by a cylindrical continuation of canal, or that there is interpoſed a cell or follicle?

8. On this point, the opinions of *Malpighi* and *Ruyſch* divide anatomiſts:

Malpighi having examined into the ſtructure of glandular bodies, obſerved bundles of circumſcribed knotted appearances aſſuming a globular form, to which he gave the name of *corpora globoſa*; and by further examination by means of injection, he found them ſtill more conſpicuous in conſequence of diſtention: hence he inferred that they were hollow, and that each of them conſiſted of a cell or follicle.

9. RUYSCH, it ſeems, in the earlieſt part of life, embraced this opinion; but from employing himſelf frequently in exploring the ſtructure of glandular bodies by injection, he was led to relinquiſh the doctrine of *Malpighi*, and to inſtitute another which ſeemed to him more conſonant to nature.

10. FROM his injections he was induced to believe, that the appearances

deſcribed by *Malpighi* were fallacious; and that they were not mere *cryptæ*, or cells, as they had been repreſented, but conſiſted of a ſeries of veſſels coiled up in a circumſcribed form, and that the ultimate branches of the ſecreting veſſel communicated both with the returning vein and excretory duct by a continuation of canal.

II. WITHOUT examining the merits of theſe doctrines, as applied to different glandular bodies, we may obſerve, that in the liver there are ſome appearances favourable to the Malpighian opinion. If a ſubtile injection be thrown in by the *vena portarum*, and the liver cut afterwards into thin ſlices, there will be found knotted appearances that bear a ſtrong reſemblance to cells, and which from their equality of bulk, and uniformity of ſhape, cannot be conſidered as the produce of extravaſation.

12. THE kidney likewiſe, when injected by the emulgent artery, rather minutely exhibits, in its cortical part, knotted appearances equally regular to thoſe in the liver.

13. BUT here again the queſtion returns upon us—*Do they, or do they not conſiſt of aſſemblages of veſſels*; *or are they mere cavities?* Feeling my incapacity of ſolving this problem to the ſatisfaction of my hearers, I muſt beg leave to withdraw myſelf from the conteſt in the beautiful language of the Roman poet:

> Non noſtrum inter vos tantas componere lites.

CHAP. VI.

COURSE OF THE BILE.

SECT. I.

Confessing then our inability to determine the preciſe ſtructure and mechaniſm of the parts, which form the immediate ſeat of ſecretion, it remains to trace the courſe of the bile from the interior part of the liver to the place deſtined for its reception.

2. The bile being formed, is con-

veyed from the ſeat of ſecretion by the branches of the hepatic duct, which, at their origin, are very minute, and are there called *pori biliarii.* From theſe it paſſes into larger branches, and thence gradually into the trunk of the hepatic duct.

3. IT is probable that the bile is not merely conveyed through theſe paſſages, but that it undergoes, during this courſe, a change from dilution to concentration; for the numerous abſorbents with which the liver is ſupplied, and which originate from its interior parts, make it highly probable that the more aqueous particles are removed by that ſyſtem, and carried into the circulation, leaving the remaining fluid in a more active condition.

4. THE bile having arrived at the trunk of the hepatic duct, naturally

paſſes forwards into the *duodenum*. But we are not to conſider its motion as uniformly progreſſive and without interruption: for it is probable, from the oblique manner in which the biliary duct perforates the ſubſtance of the inteſtine, that the periſtaltic motion of that gut, conſiſting in part of the contraction of its circular, and in part of that of its longitudinal fibres, will, by compreſſing the duct at its termination, occaſion frequent, but momentary interruptions.

5. **During** theſe periods the duct muſt neceſſarily ſuffer a degree of diſtention, but which is ſoon relieved by means of a canal of communication with the gall bladder, viz. the cyſtic duct. So that it appears, that the motion of the bile is not conſtantly in the ſame direction, but ſometimes paſſing from

the liver to the inteſtine, at others, from the inteſtine to the gall bladder.

6. In moſt ſubjects that we examine, this receptacle contains a conſiderable quantity of bile, on an average an ounce may be about the medium quantity.

7. If this bile be compared with that of the hepatic duct, it will be found thicker in its conſiſtence, of a darker colour, and more pungently bitter: for here alſo, as well as in the liver, there are numerous abſorbents, which remove the watery parts. But it is probable, that the increaſed viſcidity depends in part on the mucus ſecreted by the gall bladder itſelf, ſo that cyſtic bile may be conſidered as a compound fluid.

8. The gall bladder then appears to be an occaſional receptacle for the bile, whenever there is an impediment to its paſſage by the common duct into the

inteſtine; and this, as a *diverticulum*, prevents a ſurcharge, which would probably take place in the hepatic duct.

9. THAT this purpoſe is anſwered, is probable from what takes place when from any cauſe the cyſtic duct is obſtructed, for in this caſe the bile, finding no paſſage into that receptacle when its courſe into the *duodenum* is obſtructed, neceſſarily accumulates in the *ductus choledochus communis* and *hepaticus*, and conſequently enlarges the capacity of thoſe canals.

10. THAT this is a law of Nature, we appeal to the diſſection of morbid bodies where this complaint exiſted; and there is a caſe in point, related by Dr. Ludwig, of Leipſic, in which the *ductus choledochus communis* was dilated to more than an inch in diameter.

11. THIS explanation of the courſe of the bile to and from the gall bladder, appears the moſt ſatisfactory, and is that moſt uſually received; but the eſtabliſhment of it has met with oppoſition upon two grounds.

Firſt, That the gall bladder ſecretes its own bile; and,

Secondly, That the branches of the hepatic duct, while in the ſubſtance of the liver, detach ſmall canals leading immediately into the cyſt; and from which they have received the compound name of hepatico-cyſtic ducts.

12. THE principal ſupporter of the firſt of theſe propoſitions is *Albinus*. He was led to this from the vaſcularity of the gall bladder; from its internal ſurface having an appearance like follicles; and from the gall bladder having been

found diſtended with bile when the cyſtic duct was completely obſtructed by a gall ſtone.

The two firſt arguments are barely preſumptive; it will therefore be unneceſſary to refute them in form.

The laſt, being more ſpecious, may deſerve ſome conſideration: we will begin with admitting the fact.

13. Now it is well known that the gall bladder frequently contains biliary *calculi*, at the ſame time that it is diſtended with bile. Suppoſing, then, that one of theſe concretions happens to make its way into the cyſtic duct, and that the patient, being of an irritable habit, dies from this, or from any other cauſe, and the body be examined under theſe circumſtances; in ſuch a caſe the gall bladder will be found diſtended with bile when its retrograde courſe by the cyſtic

duct is obſtructed: but diſtenſion is from the bile previouſly contained in that receptacle.

Here then is a ſource of fallacy!

14. But if it be true that the gall bladder is ſometimes diſtended with bile when the cyſtic duct is obſtructed, it is no leſs ſo, that it is ſometimes found empty; and at other times it contains a fluid compoſed principally of its mucous ſecretion, and that tinged only with a ſmall quantity of bile.

15. The propoſition relative to the exiſtence of the hepatico-cyſtic ducts needs further ſupport: they have been frequently ſought for, in vain, in man and in other animals. In the ox ſome have contended for their exiſtence. In the ſerpent tribe they certainly do not exiſt; for in theſe animals the gall bladder is detached from the liver, ſo that there is

no poſſibility of communication except by the intervention of the cyſtic duct. In the human ſubject their exiſtence may be eaſily diſproved by experiment.

16. If the gall bladder be emptied of its contents, and either air or water be injected into the liver by the hepatic duct, neither of them will penetrate into the gall bladder. Now as fluids of ſo ſubtile a nature as theſe, would readily pervade thoſe ducts if they exiſted, we neceſſarily conclude that the gall bladder receives its bile by the cyſtic duct.

17. But the cauſes which determine the retrograde courſe of the bile from the *ductus communis* into the gall bladder by the *ductus cyſticus*, are not conſtant and uniform in their operation: they admit of intervals, during which this motion of the bile is either entirely

ſuſpended, or changed for one directly oppoſite. Were it not ſo, the gall bladder would be in a conſtant ſtate of ſurcharge, and of courſe become diſtended to an enormous ſize, ſo that a rupture of it would be endangered.

18. To guard againſt this evil, a part of its contents is occaſionally diſcharged from the preſſure which the ſurrounding parts are conſtantly making on it; and this preſſure will vary ſomewhat in its force from the relative degrees of diſtention of the ſtomach from food: ſo that at this time there is a more copious flow of bile into the *duodenum* than at any other.

19. By this mode of diſcharging the contents, the gall bladder is conſidered as a paſſive receptacle. But this idea has been controverted; at leaſt it has not always been admitted in the extent here

ſtated. Arguments, founded on analogy, have been adduced to prove that it poſſeſſes ſome active power on its own contents; and that though aſſiſted by the preſſure of adjacent parts, as acted upon by the diaphragm and abdominal muſcles, yet that there was inherent in it a power by which it co-operated with thoſe agents, and relieved itſelf from any accumulation.

20. THE analogy here alluded to is the urinary bladder, which, by its own muſcular power, is able to evacuate its contents.

21. DILIGENT ſearch has been made by anatomiſts to diſcover muſcular fibres in the gall bladder, and ſuch a ſtructure has been deſcribed, but their preciſe direction is not yet agreed upon. This difference of opinion, though it does not diſprove their exiſtence, yet it weakens

the probability of it; for, an appearance ſo equivocally and indiſtinctly marked as to admit of a diverſity of deſcription, divides the mind too much to admit of its receiving any of them.

22. THIS difficulty has induced anatomiſts to adopt another criterion of muſcularity, viz. *irritability*; and with a view either to eſtabliſh or to diſprove its preſence, experiments have been inſtituted. Various ſtimulating powers, both chymical and mechanical, have been applied to the gall bladder, without producing any evident contraction. Mechanical *ſtimuli* indeed produce no effect; and when any contraction has followed the uſe of chemical applications, it has been confined to ſuch as acted by a corroding quality, and where the apparent contraction has been nothing more than the corrugation which

may be induced on inanimate animal matter. Upon this ſubject the experiments of Baron Haller appear to be ſufficient and deciſive.

23. HAVING explained the powers by which the bile is conveyed from the liver and the gall bladder into the duodenum, we are naturally led to contemplate the means, by which its return from the duodenum is prevented.

24. THE contrivance is ſimple and effectual. It conſiſts of nothing more than the oblique manner, in which the common biliary duct paſſes through the coats of the inteſtine from the external to the internal ſurface, and by which the office of a valve is performed; ſo that while the bile has a free paſſage from without inward, the orifice of the duct collapſes when a contrary direction is attempted.

25. THE cauſes which impede the flow of bile into the *duodenum* are generally very tranſient in their operation, under which ſtate there is only a moderate ſurcharge of the ducts, and no material inconvenience enſues. But it happens, not unfrequently, that the obſtruction is of a permanent nature, in which caſe the bile is neceſſarily detained in theſe parts for a time, after which it finds its way into the maſs of blood, where, by being circulated through every part of the body, it gives yellowneſs to the ſkin, and produces jaundice.

26. THE cauſes which occaſion this obſtruction are various. A very common one is the preſence of a gall ſtone either in the hepatic or common duct; perhaps the latter is more general, as biliary *calculi* form more frequently in the gall bladder, where the bile is in a

ſtate of quieſcence, than in the branches of the hepatic duct, where it is in motion.

27. SOMETIMES a ſtricture of the common duct is an obſtructing cauſe; ſuch as have been diſcovered after death, are uſually of that permanent kind connected with a diſeaſed condition of that part, a removal of which can ſcarcely be hoped for.

28. BUT a cauſe of jaundice has been referred to a ſpaſmodic ſtricture of this duct, and which, as not being connected with a change of organization, may attack by paroxyſms, returning at indeterminate periods.

29. WITHOUT examining into the ſymptoms which have been ſuppoſed to characteriſe this cauſe; it may poſſibly be thought a ſufficient refutation to prove, that the biliary ducts of a living

animal poſſeſs no marks of irritability when acted upon by *ſtimuli*; the contrary of which we ſhould expect were they furniſhed with muſcular fibres.

The only part where the common duct can be affected ſpaſmodically, is during its paſſage through the coats of the *duodenum*, by the muſcular fibres of that inteſtine; and here we ſhould diſtinguiſh between the contraction of the inteſtine in which the biliary duct is paſſive, and a contraction of the duct itſelf.

30. ANOTHER cauſe of obſtructed bile conſiſts in a preſſure of the duct by the head of the *pancreas*, which is ſometimes found in a ſchirrous ſtate, and which, from its connection, may eaſily produce ſuch an effect: for the biliary duct, a little before it terminates in the inteſtine, penetrates ſome way into the

the ſubſtance of the *pancreas*, and receives the excretory duct of that gland. Therefore the orifice which appears on the inner ſurface of the *duodenum* tranſmits in common the bile and pancreatic fluid.

31. To the cauſes of obſtruction already enumerated, there is another ſometimes annexed; viz. a ſcirrhous impacted ſtate of the liver, which from a very extenſive depoſit of ſolid matter throughout its ſubſtance, in an interſtitial form, diminiſhes the capacities of the *pori biliarii*, ſo that they are unable to carry off the bile as faſt as ſecreted, and an accumulation of it within the ſubſtance of the liver muſt therefore neceſſarily enſue.

32. HITHERTO the cauſe of jaundice has been referred to obſtruction in ſome part or other of the biliary ducts. But there are ſome caſes which incline us to

believe that jaundice may exiſt, though the biliary canals are pervious and free. The yellow fever of the Weſt Indies furniſhes an inſtance in point. The characters of this complaint are a diffuſion of bile through the maſs of blood, producing jaundice, with an exceſſive quantity of it in the alimentary canal, ſo that it is diſcharged by vomiting and purging. In this caſe, jaundice ſeems referrible to a redundant ſecretion.

33. BUT *Boerhaave* and *Morgagni* have favoured an opinion the direct reverſe of this. They conſider jaundice ſometimes as the effect of a ſuſpended ſecretion, and that the blood in conſequence of this retains a bilious character, thereby giving a yellowneſs to the ſkin.

34. THIS opinion is founded on a miſtaken notion, that all the ſecreted fluids pre-exiſt in the maſs of blood;

and that the province of the different glands is confined to the mere mechanical ſeparation of thoſe fluids.

35. As there are few, if any, phyſiologiſts, of the preſent day, who entertain ſuch an opinion of glandular ſecretion, to offer any thing in an argumentative nature, by way of refutation, would be altogether ſuperfluous. It is now generally underſtood and believed, that the blood is the *pabulum* or ſource of all the ſecretions, and that the glands through which it circulates, change its properties, each according to its peculiar mode of action; ſo that the ſecretions may be conſidered as new fluids created by their reſpective glands.

36. If this idea of ſecretion be true, it muſt neceſſarily follow, that if the action of the whole ſecreting ſyſtem of the liver be arreſted, no bile can be

formed, and conſequently none can be conveyed into the maſs of blood. To argue otherwiſe would be to oppoſe every principle of reaſoning; it would be imputing effects to a cauſe which has no exiſtence.

37. IN every caſe of jaundice bile muſt be ſecreted and carried into the blood veſſels; but the channel by which it is conveyed has given riſe to controverſy.

38. THERE are on this ſubject two opinions which divide phyſiologiſts; ſome of whom aſſert, that the bile after ſecretion is carried to the blood veſſels by its regurgitation, whilſt others attribute this effect to abſorption.

The firſt opinion has moſt generally prevailed.

39. BARON HALLER, who introduced this to our notice, reſts his opinion on

the free communication of veſſels in the interior part of the liver; but more eſpecially on a communication between the hepatic veins and biliary ducts. The proof of this communication is fair and deciſive.

40. He obſerves that a ſubtile injection thrown in by the hepatic duct will eſcape readily by the hepatic veins. This is a fact; and I know from experiment that water injected in the ſame direction will return by the veins in a full ſtream, though very little force is uſed. From the facility with which water takes this retrograde courſe, a probability ariſes, that, if from any cauſe the natura direction of the bile be obſtructed, it will naturally obey the ſame direction.

This explanation of jaundice ſeemed fully ſufficient to ſatisfy the mind of Baron *Haller*.

41. BUT a more extenſive acquaintance with the economy of the abſorbent ſyſtem has given a new turn to this ſpeculation, and has induced a phyſiologiſt of the preſent day, to ſolve the cauſe of jaundice on the principle of abſorption only. This opinion reſts on an experiment where the hepatic duct of a living animal was tied, and afterwards the abſorbents of the liver were very much loaded with bile.

42. THIS fact certainly proves that the abſorbents have the power of taking up bile; a circumſtance which I apprehend would be generally admitted, though it had not received the confirmation of experiment. But it does not invalidate the probability of a part paſſing into the blood veſſels by the hepatic veins; the circumſtances and facts upon which that opinion reſts, retain all

their original force, and ſtand unaffected by this experiment.

43. THE queſtion then ſeems to be, whether in caſes of jaundice the bile paſſes into the blood veſſels by regurgitation, by abſorption, or by both channels?

44. THAT the abſorbents take up the bile from the interior part of the liver, and convey it by the thoracic duct into the maſs of blood, the following experiment will evince.

EXPERIMENT.

45. AN inciſion was made into the abdomen of a living dog, large enough to allow a ligature to be made on the hepatic duct; this being done, the *parietes* of the *abdomen* were brought together by ſutures. Two hours after,

the dog was ſtrangled, and the parts carefully examined. On inſpection it appeared that the abſorbents had been very active, for they were very much diſtended with a fluid of a bilious colour, and their courſe, which was very conſpicuous, could be traced with the greateſt eaſe to the thoracic duct, the contents of which ſeemed only moderately bilious. The bilious colour was in a great meaſure concealed by the red particles of blood, which had been extravaſated by the injury, taken up by the abſorbents, and conveyed into that canal. It is probable, however, that the bile was only juſt entering the blood veſſels, as a very careful inſpection of the tunica conjunctiva of the eye did not betray the ſlighteſt appearance of jaundice.

46. It ſeems then that during the

ſpace of two hours, the ſecretion of the liver had been ſufficient in quantity to diſtend its ducts; to ſtimulate the abſorbents to relieve that diſtention; and to allow of a ſmall portion of their contents to be conveyed into the blood veſſels.

47. But it ſtill remains to determine, whether or not a ſmall quantity of bile was not regurgitating by the hepatic veins during the proceſs.

48. To aſcertain this, a ſecond dog was procured, and a ligature made on the hepatic duct as in the preceding experiment. Two hours after, blood was taken from the jugular vein, and ſet to reſt, in order that it might ſeparate into its *ſerum* and *craſſamentum*. The liver was then drawn down a little from the diaphragm, and blood take from one of the hepatic veins. This blood, as well

as the former, was allowed to ſeparate into parts; and on immerſing pieces of white paper into the *ſerum* of each, *that* taken from the hepatic veins gave the deepeſt tinge, the *other* produced *only* a very ſlight degree of diſcoloration.

49. In this experiment the period of examination was the ſame as the laſt, viz. two hours; a ſpace of time juſt ſufficient for the bile to begin to make its way into the circulation without having poured in ſuch a quantity as to tinge in any ſenſible degree the general maſs of blood. Hence we ſee evidently why the blood which was returning from the liver by the hepatic veins, contained a larger proportion of bile than that taken from the general circulation.

50. As the firſt of theſe experiments proves, that the abſorbents of the liver are concerned in the production of jaun-

dice, ſo the laſt demonſtrates with equal force, that when from the operation of any obſtructing cauſe the bile is accumulated in its ducts, ſo as to diſtend them in a conſiderable degree, Nature relieves herſelf, in part, by allowing a portion of it to take a retrograde courſe by the hepatic veins.

CHAP. VII.

BILE.

SECT. I.

THIS fluid, upon bare ocular inſpection, is apparently homogeneous; of a green colour, in which a yellow ſhade is very conſpicuous when the bile is diluted with a watery fluid; but if examined in its more concentrated ſtate, is of a deep green. Hence it is that the dilution of this fluid by the more watery parts of the blood gives the yellowneſs of jaundice.

2. THE conſiſtence of bile is uſually viſcid, and its tenacity is ſometimes ſuch that it cannot be poured from a phial in drops, but is drawn out into threads like the *albumen ovi.*

3. BUT a queſtion may here ariſe, How far this tenacity is eſſential to the bile, or whether it may not be explained on the principle of its being a compound fluid, conſiſting in part of genuine bile, with a portion of that mucus which is ſecreted by the gall bladder; for it is the bile contained in this receptacle, which is uſually the ſubject of chymical experiment.

4. WHEN bile is agitated in a phial, it forms a lather in the form of ſoap and water; and that it really poſſeſſes ſaponaceous properties is rendered high-

ly probable from the uſe to which it is applied by ſcourers of cloth; it being known to aſſiſt very powerfully in the removal of greaſy ſpots.

5. To theſe ſenſible properties we may add its *taſte* and *ſmell*; the firſt being intenſely bitter, with a degree of pungency; the laſt of a faint and nauſeous nature.

6. From this aſſemblage of properties, we naturally preſume, that bile is a ſaponaceous fluid combined with a mucilaginous ſubſtance, from which it receives its tenacity; and to theſe are ſuperadded the green colouring matter and the principle of bitterneſs.

7. It is therefore the province of chymiſtry to determine by careful and accurate inveſtigation, in what degree theſe conjectures concerning the nature

of that fluid can be confirmed by experiment.

8. In the firſt dawnings of chemical knowledge, when our acquaintance with the agents of chemiſtry, and their effects on matter, was narrow and confined, the means uſually employed to aſcertain the component parts of bodies, were ſeldom any other than thoſe of ſubjecting them to diſtillation by different degrees of heat, from the leſs violent to the more intenſe. Having exerted the whole power of the furnace in this way, the inquirers thought themſelves in poſſeſſion of a very perfect *analyſis* of every body, which they thus ſubmitted to inveſtigation.

9. But reflection and an extended ſtate of knowledge, ſoon convinced them how remote they were from a thorough acquaintance with the conſtituent parts

of bodies; and their unſucceſsful attempts to reproduce the original ſubſtance, by a recombination of ſuch of its elements, as they, in this way, were able to collect, ſoon convinced them, that another, and leſs fallible, mode of proſecuting theſe inquiries was very much to be wiſhed.

10. Besides, they were not acquainted with the nature of the agent they employed, either abſtractedly, or in a ſtate of combination with matter; therefore the changes thus induced could be but imperfectly underſtood.

11. To guard againſt this difficulty, another, and more natural, mode of inveſtigating bodies was introduced; viz. the forming of different compounds by the addition of certain chemical reagents; and in this way it was found that a more correct analyſis could be ob-

tained. Thus the torturing of bodies by the application of *heat*, neceſſarily yielded to the more natural examination by chemical attractions.

12. It is by no means intended here to proſcribe altogether the agency of *heat*, it being often found eſſentially uſeful as an auxiliary to the chemical bodies employed, enabling them the better to effect their different decompoſitions and combinations.

13. A quantity of *recent ox bile* being procured, ſeveral experiments were inſtituted, with a view to aſcertain its component parts.

EXPERIMENT I.

14. A portion of it being received into a ſhallow earthen veſſel, was evaporated cautiouſly by a moderate heat.

On examining the vapour, it appeared to be principally water poſſeſſing neither acid or alkaline properties, but ſtrongly impregnated with that principle, in which the peculiar odour of bile chiefly reſides. The *reſiduum* gradually inſpiſſates and aſſumes the form of an extract; which, if the evaporation be carried ſufficiently far, will become as brittle as reſin, and may be pulverized with equal eaſe.

15. FROM this experiment we learn that the fluidity of bile depends chiefly on *aqueous* matter, and that in the exhalation of it even by the more moderate degrees of heat, it is accompanied by the odorous principle, which, it ſeems, is of a very volatile nature.

16. As bile poſſeſſes a conſiderable degree of tenacity, and as the tenacity of animal fluids depends chiefly on a

mucilaginous principle, it was determined next to aſcertain whether that principle gives viſcidity to the bile.

EXPERIMENT II.

17. On a portion of bile was poured a quantity of alcohol; a *coagulum* was immediately formed, which floated in a green liquor. On filtering this compound the green fluid readily paſſed, while a mucilaginous ſubſtance of conſiderable tenacity was detained by the paper. This mucilage was of a whitiſh colour, and poſſeſſed only a ſlight degree of bitterneſs, while the filtrated liquor preſerved both the bilious colour and taſte. It is ſcarcely neceſſary to add, that it was free from viſcidity. The GLUTINOUS principle of the bile ap-

pears then to reſide in an animal mucilage.

18. THE *fluidity*, *odour*, and *viſcidity* of bile being thus accounted for, we are next led to the inveſtigation of the principles on which its bitterneſs, colour, and ſaponaceous quality, depend.

EXPERIMENT III.

19. To a quantity of recent bile was added a diluted marine acid; a coagulation was produced. The fluid ſeparated by the filter was of a green colour, but much lighter than that of bile; and, notwithſtanding the predominance of the acid, the bitter taſte was very diſtinguiſhable.

20. THE more ſolid matter detained by the filter was very glutinous, of a green colour, and intenſely bitter.

EXPERIMENT IV.

21. Two other portions of bile were put into proper veſſels; to one was added a diluted vitriolic, to the other a diluted nitrous, acid. Both exhibited *phenomena* like the laſt experiment. The filtrated liquors were green, and bitteriſh; the *coagula* intenſely ſo, and glutinous.

22. As, in theſe experiments, the decompoſition appeared to be incomplete, it was thought eligible to try, whether or no a more perfect ſeparation might not be obtained by the aſſiſtance of heat.

EXPERIMENT V.

23. A QUANTITY of bile and diluted marine acid were put into a flaſk, and

placed in a ſand bath until they had acquired the boiling heat. On inſpection, the ſeparation into parts was very evident; and on committing it to the filter, it ſeparated a colourleſs fluid deſtitute of every bilious property. The *reſiduum* conſiſted of a very dark green maſs, intenſely bitter and extremely glutinous. When examined, it appeared to be compoſed of an animal mucilage, in combination with a reſinous ſubſtance.

24. BUT to aſcertain in what way the acid had effected the decompoſition, it became neceſſary to examine the filtrated liquor. It was therefore ſubjected to a cautious evaporation, and, at a proper period, was ſuffered to cool.

25. UNDER cooling, cryſtals were formed of a cubic figure, which decrepitated by heat, and poſſeſſed all the characters of common ſalt.

Therefore the decompoſition was here occaſioned by the marine acid engaging the mineral alkali, which it ſeparated from the other element of the ſaponaceous body, and by uniting with that *baſis*, formed common ſalt.

26. But, notwithſtanding we are able to account for the production of common ſalt in this way, it does not exclude the poſſibility of a ſmall quantity of it pre-exiſting in the bile, independent on this artificial combination of its elements.

27. To ſatisfy my doubts on this point, the following experiment was made.

EXPERIMENT VI.

28. To a portion of bile was added alcohol, in quantity ſufficient to ſet

looſe all its mucilaginous matter. The fluid part, being ſeparated by a filter, was examined by nitrated ſilver, but no *luna cornea* was produced: therefore the marine acid (the acid principle of common ſalt) does not appear to have any exiſtence in the bile.

29. FROM this experiment we learn that the ſaline *baſis* of the ſaponaceous matter of the bile is the mineral alkali; but the other element is ſtill a queſtion.

EXPERIMENT VII.

30. To determine this point a quantity of bile was decompoſed by a diluted marine acid, aſſiſted by heat (as in Experiment V.) The *coagulum* detained by the filter was examined. It appeared to poſſeſs moſt of the characters of bile in a ſolid concentrated ſtate. It had

a pungent bitter taſte, dark green colour, and extremely glutinous. When perfectly dry, was very inflammable, and burned with as much rapidity as any bituminous ſubſtance would do.

31. THIS appearance led to a ſuſpicion of the preſence of a reſin, but as a higher degree of certainty was ſtill wiſhed for, further experiment was neceſſary.

EXPERIMENT VIII.

32. I THEREFORE diffuſed a portion of this *reſiduum* through rectified ſpirit of wine: a large proportion of it was diſſolved, which imparted to the ſpirit both the colour and taſte of bile; the inſoluble part being chiefly of a mucilaginous nature.

33. FROM the facility with which al-

cohol diſſolves the green and bitter part, it is ſcarcely probable, that it partook of the nature of an unctuous oil; but that it was neither a reſinous body, or a kind of eſſential oil.

34. This point was eaſily determined: for on the addition of water to the ſolution, a precipitation took place. The filtered liquor was colourleſs and free from bitterneſs. The *reſiduum* was nothing more than a reſinous ſubſtance, in which reſided both the colouring principle and bitter taſte.

35. On taking a retroſpect of the above experiments, the bile appears to be reſolvable into the following elements, viz.

Firſt, Water, impregnated with the odorous principle.

Secondly, A mucilaginous ſubſtance reſembling the *albumen ovi*.

Thirdly, A reſinous ſubſtance containing the colouring principle and bitter taſte. And

Fourthly, The mild mineral alkali.

36. WITH reſpect to their combination, it ſeems that the ſaponaceous matter conſiſts of the bitter reſin in union with the alkali: this admits of a ready union with a mucilage, and with this again the aqueous matter very eaſily combines, ſo that the whole forms a maſs apparently homogeneous.

37. THE following experiments were inſtituted with a view of examining ſome doctrines, founded on the bile having a greater power of reſiſting putrefaction than the blood.

EXPERIMENT IX. AND X.

38. EQUAL quantities of blood and bile of the ſame ox were each put into a different veſſel of the ſame ſize, and expoſed to the ſame degree of heat. On the third day the blood began to give out by its odour marks of putrefaction; the bile remained in its natural ſtate.—On the fourth day the bile had a pungent odour by no means ungrateful, while the blood was extremely putrid.—On the ſixth day the bile became putrid, and had a very offenſive ſmell.

CHAP. VIII.

ON BILIARY CALCULI.

SECT. I

BEING favoured by Dr. Baillie with an opportunity of examining the ſtructure, and general appearance of biliary *calculi*, I found that they are very generally either of a lamellated or radiated ſtructure: on the outer ſurface chiefly the former; on the inner the latter. The colour is extremely various: in ſome they are of a light colour approaching to a white, in others as black as jet; in many of a brown or ochry appearance: theſe laſt have generally a very bitter taſte; the radiated part is frequently white, and without taſte.

2. They are very generally inflammable, and fuſible in the fire; and, for the moſt part, they are ſoluble in ſpirit of wine and oil of turpentine. There are ſome, however, which are not ſoluble in either of theſe fluids. Many of them have the conſiſtence of *phoſphorus*, and cut like wax.

3. In the radiated *calculi* there is a ſubſtance in every reſpect like *ſperma ceti*. Some *calculi*, inſtead of burning with a flame, only become red and conſume to an aſh, like a cinder.

4. This variety in the appearance of calculi clearly evinces that they are not mere inſpiſſations of bile, but that there

is a difference either in the component parts themſelves, or in the proportion of thoſe parts.

5. THEREFORE in chemical inveſtigation it ſeems neceſſary that experiments ſhould be made on different ſpecimens, as it is probable, even *a priori*, that the reſult of experiments made on one ſpecimen, will not apply very ſtrictly to a ſeries of inquiries made on another.

6. As we preſume from bare inſpection, that theſe calculi are not mere inſpiſſations of bile, but that they contain principles which are not to be found in that fluid, it affords a ſubject of rational inquiry to determine what are thoſe elements, and of what nature is their combination.

7. To aſcertain this, ſeveral experiments were inſtituted on a calculus of the following characters.

The external ſurface was of a chocolate colour; when rubbed off it had a lighter coloured layer underneath.

On making a ſection through its centre, it appeared to be compoſed of lamellæ.

It was rubbed to powder very eaſily.

Its taſte was moderately bitter.

It was fuſible by heat, and when inflamed, burned like a reſinous ſubſtance.

Ol. terebinth. unaided by heat, diſſolved a very large portion; but alcohol under the ſame circumſtances diſſolved only a ſmall part.

8. To determine how far the agency of heat could aſſiſt the ſolvent power of alcohol an experiment was made.

EXPERIMENT.

Twenty grains of this calculus were

infuſed in an ounce of alcohol, and after previous agitation, the phial was placed in a ſand bath. Before the fluid had arrived at the boiling point, it diſſolved nearly the whole of the ſubſtance. The clear liquor, being poured from the reſiduum, was ſuffered to cool. Under cooling, the whole aſſumed the appearance of a ſolid cryſtallized maſs.

EXPERIMENT.

9 A SMALL quantity of alcohol being poured on this reſiduum and aſſiſted by heat as before, exhibited very little ſolvent power. Theſe experiments ſhew that there is a ſmall proportion of this biliary calculus which reſiſts the ſolvent power of alchohol. What is its nature?

EXPERIMENT.

10. To this reſiduum was added a quantity of diluted marine acid. A ſufficient time having elapſed, the fluid was committed to the filter. To the clear liquor was added a portion of the aq. kali, and a white precipitation, apparently of an earthy nature, immediately took place*.

Hence one point in which a biliary calculus differs from fluid bile is, in containing a quantity of earthy matter.

11. THE cryſtallized maſs formed by the alcohol was next ſubjected to examination. Some of the phenomena already related having led to a ſuſpicion, that

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[*] I ſuſpect it to be of an earthy nature not only from its ſolubility in an acid, but from its poſſeſſing no inflammability.

a reſinous matter forms one of the conſtituent parts of biliary calculi, the proof of it was reſerved for the following experiment.

EXPERIMENT.

12. THE cryſtallized maſs, being made fluid by heat, was poured into a pint of water; a white flocculated precipitate was immediately formed, leaving an opaque ſupernatant liquor. The whole was committed to the filter, and the ſolid part being collected and dried, was found to be of a reſinous nature.

EXPERIMENT.

13. To the clear filtered liquor was added a ſmall quantity of diluted marine acid, from a ſuſpicion that an al-

kaline principle might form one of the conſtituent parts of a gall ſtone, as well as of the bile, and by that means a ſmall portion of the reſinous ſubſtance might ſtill be held in ſolution; but no precipitation followed. This experiment makes the preſence of an alkali ſomewhat equivocal; but the following proved its exiſtence very ſatisfactorily.

EXPERIMENT.

14. THE fluid mixture of the laſt experiment was carefully evaporated almoſt to dryneſs. On cooling, two kinds of cryſtals formed; one ſpiculated, the other cubic. The cubes, poſſeſſing the characters of common ſalt, proved the preſence of the mineral alkali: and the ſpiculated cryſtals, which were the common crude ſal ammoniac, afforded preſumptive evi-

dence in favor of the volatile alkali. But what placed the matter beyond doubt was the following experiment.

EXPERIMENT.

15. A DROP or two of aq. kali was added to theſe cryſtals, and the volatile alkali became immediately ſenſible.

16. FROM theſe experiments we infer that this ſpecimen of biliary calculus conſiſted chiefly of a reſinous matter, with a ſmall proportion of earth, apparently calcareous, combined with the mineral and volatile alkali.

CHAP. IX.

OF THE USE OF THE BILE.

SECT. I.

GREEN and bitter bile being in common to all animals with red blood, and found only in ſuch, makes it probable that there is ſome relative connexion between this fluid and the colouring matter of the blood, by the red particles contributing more eſpecially to its formation. An opinion very generally prevails, that the bile aſſiſts in the proceſs of chylification, by mixing with the digeſted food contained in the *duodenum:* for it is demonſtrably true, that the digeſted matter does not aſſume a chylous form until it has paſſed below that part of the inteſtine where the biliary and pancreatic ducts make their entrance. And upon the ground of this fact, it has been preſumed, rather than demonſtrated, that either all, or ſome of the conſtituent parts of the bile contribute to chylification. What foundation exiſts for ſuch an opinion the following experiment will tend to ſhew.

EXPERIMENT.

2. A DOG was fed with animal food, and in three hours the *abdomen* was opened.—A portion of the *duodenum*, and *jejunum* of conſiderable length, was cut

open, ſo that the contents might be obſerved. Portions of food, reduced to a pultaceous maſs, were ſeen oozing through the *pylorus*; the bile was likewiſe obſerved to paſs ſlowly out of its duct, which, when carefully attended to, appeared to flow over the ſurface of the digeſted matter adhering to the inteſtine. Upon removing the bile from the ſurface of this digeſted matter, it did not appear to have mixed with it in any ſenſible degree.

3. HENCE it ſeems ſomewhat doubtful, whether the bile really forms one of the conſtituent parts of the chyle, as has been imagined, or not. If, however, all, or any of the elements of bile do contribute to chylification, no traces of their preſence can be diſcovered from the ſenſible properties of the chyle.

4. Another difficulty in admitting this as one uſe of the bile, is, from the circumſtances of jaundice. In this complaint, the paſſage of that fluid into the inteſtine is either completely obſtructed, or very much impeded; but there are no ſymptoms which clearly manifeſt a defect of chylification.

5. One important uſe of the bile is unqueſtionably that of ſtimulating the inteſtine, and performing the office of a purgative; for when the excretion is impeded, as in the jaundice, the inteſtines being deprived of their natural *ſtimulus*, become torpid, and coſtiveneſs enſues. This torpor is diffuſed by ſympathy over every part of the ſyſtem, and languor and laſſitude prevail.

6. It is probable therefore, that even admitting the bile to contribute ſome-

what to the digeſtion and aſſimilation of our food; its principal office is that of a natural and habitual *ſtimulus* to the inteſtines, keeping up their energy and periſtaltic motion, which may be affected either by an increaſe of its quantity, or a change in its quality, produced by diſeaſe.

It frequently occurs that bile is ſecreted in too ſmall a quantity, as in hypochondriacal complaints, and in chloroſis; in which diſeaſes an unuſual degree of torpor takes place, expreſſed in the one caſe by dejection and deſpair; in the other by inactivity and languor; the ſtools are generally of a light clay colour, and the body is coſtive.

Bile therefore is a ſtimulus by which tone and energy are communicated from the inteſtines to the whole body, the defect of which on the primæ viæ is more productive of diſeaſe, than its exceſs. In the latter caſe, if it be healthy in its nature, it only proves a ſalutary purgative, but if in a diſeaſed ſtate, it deranges the animal œconomy like any other foreign ſtimulus which may be applied to the inteſtines.—It is not improbable, but that from its bitterneſs it poſſeſſes antiſeptic powers, which are peculiarly uſeful in the inteſtinal canal.

Having thus finiſhed the anatomical and phyſiological parts of this ſubject, before I proceed to the conſideration of the other branches of it, I ſhall take this opportunity of acknowledging my obligation to an ingenious friend, Mr. Haighton, Teacher of Phyſiology at Guy's Hoſpital, by whom the experiments on living animals were conducted, upon which many of the opinions and doctrines, advanced in this treatiſe, are founded.

OF THE DISEASES OF THE LIVER DEPENDING ON ITS FUNCTIONS AS AN ORGAN OF SECRETION.

CHAP. I.

OF THE INCREASED SECRETION OF BILE.

SECT. I.

THE inhabitants of warm climates are extremely ſubject to diſeaſes ariſing from the increaſed ſecretion of bile, and the exceſs of its quantity in the primæ viæ, which, either by regurgitating into the ſtomach, produces a general languor of the body, together with *nauſea*, foul tongue, loſs of appetite and indigeſtion;

or, by being directed to the inteſtines, excites a painful diarrhœa, ultimately tending to weaken their tone, and diſturb their regular periſtaltic motion. It generally happens that, during the exceſs and prevalence of bile in the firſt paſſages, ſome abſorption of it takes place in the habit, ſo that the ſkin becomes yellow, and the urine is ſenſibly impregnated with it. The pulſe is quicker than natural, and there is a conſiderable degree of thirſt with an increaſe of heat, the uſual ſymptoms of fever. The body becomes emaciated, and the general aſpect of the patient is extremely unhealthy.

2. UNDER ſuch circumſtances, a change of climate becomes neceſſary, by which the ſecretion of bile is gradually diminiſhed, its powers, perhaps, rendered leſs active, and the healthy functions of the ſtomach and bowels are

again reſtored. A ſea voyage from a warm to a colder climate generally effects this purpoſe, ſuppoſing, as is frequently the caſe, that the liver and other abdominal viſcera are in a ſound ſtate.

3. SUCH ſymptoms as I have now enumerated are the ſpontaneous effects of a warm climate on healthy conſtitutions, independent of any intemperance, and cannot always be prevented by the moſt careful attention to diet, or by avoiding ſuch irregularities as, in all ſituations, contribute to produce diſeaſe.

4. THE natives of warm climates are leſs ſubject to inconveniences ariſing from the increaſed ſecretion of bile than Europeans who inhabit thoſe countries, and whoſe conſtitution, by former habits, is ill prepared to admit ſuch increaſed excitement of the liver, or ſuch additional irritation on the primæ viæ, with-

out much derangement of the animal œconomy. The bile in warm climates is, perhaps, more bitter and more ſaturated with its component parts than in colder countries, it is therefore a more active emetic or purgative, and, although it was not ſecreted in a larger quantity, its effects on the firſt paſſages would be more ſeverely felt.

5. We have had occaſion, in treating of the nature and properties of bile, to correct a common and prevaling opinion of its being extremely putreſcent; experiments, executed with great accuracy and fidelity, ſufficiently prove that it is leſs diſpoſed to putrify than any other animal fluid, and that it even preſerves in a ſweet ſtate animal ſubſtances, which, when expoſed to ſimilar circumſtances of fluidity and heat, without the admixture of bile, would in a ſhorter

time have aſſumed the character of putrefaction. It ſeems therefore to be a wiſe law of the animal œconomy, that in warm climates a larger quantity of this fluid ſhould be prepared by the conſtitution than in colder countries; and by its being more bitter and more active, it poſſeſſes a greater antiſeptic power than the milder and more diluted fluid of a colder climate; hence it is better fitted to correct and reſtrain the propenſities to ſpontaneous and putrid fermentations, ſo extremely prevalent in warm climates.

6. I DO not, however, mean to deny that many and great inconveniences are found to ariſe from the prevalence of bile in the primæ viæ; but I am firmly perſuaded, that a diminution of its natural quantity would produce diſeaſes of a more permanent and alarm-

ing nature. It is more difficult to ſupply the defect in the quantity of this fluid, than to carry off its exceſs; it is even more eaſy to leſſen or diminiſh its acrimony than to increaſe its power, and thereby render it more active, and better ſuited to anſwer the various and uſeful purpoſes intended by it to the animal œconomy.

7. I HAVE been frequently conſulted by perſons whoſe appetite and digeſtion have been much diſturbed by a long reſidence in tropical climates; and who, although they have generally received much benefit by a ſea voyage, and a gradual return to Europe, yet require the aſſiſtance of medicine, with a view to deſtroy the tendency to exceſſive ſecretion, and finally to reſtore ſtrength and vigorous action.

8. AFTER obtaining all the informa-

tion which I ſuppoſe neceſſary reſpecting the conſtitution and habits of the patient, the original and progreſſive ſtate of ſymptoms, and the effects of ſuch remedies as have been employed, I proceed to aſcertain how far any local or organic affection of any of the viſcera has taken place.—If, upon inveſtigation, I find that the conſtitution has only ſuffered by the prevalence or the exceſs of bile, and that the diſpoſition to that morbid increaſe of ſecretion ſtill remains diſturbing the functions of the ſtomach, and irritating the bowels, I recommend it to my patient, every morning before breakfaſt, to dilute the contents of the ſtomach, by drinking from half a pint to a pint of water, of a temperature from 90 to 114 degrees of Farrenheit's thermometer, likewiſe to take a moderate degree of exerciſe before breakfaſt. This may be done either in London or at Bath, though I am perſuaded, that the benefit derived is by dilution, and that tepid water dilutes better than cold water, and that pure water dilutes better than water impregnated with ſaline, earthy, or metallic matter. I do not, however, mean to diſcourage invalids from going to places of public reſort, which may contribute, by their amuſements, to reſtore a conſtitution enfeebled by a warm climate or intenſe application to buſineſs.

9. THE chemical analyſis of mineral waters has been of conſiderable advantage, ſince, beſides the diſcoveries which it has made with reſpect to the ſolid contents of many of them, it has alſo proved, with reſpect to others, which contain but little ſolid matter, that it is the quantity of water, and not

the impregnating ſubſtance, which does good.

I believe the experiment of drinking good pump water at home, of the temperature of Bath, Buxton, or Briſtol water, has ſeldom been tried. I have frequently, with much ſucceſs, recommended the uſe of warm water in dyſpeptic caſes; and in anomalous gout it ſeems to allay the irritation of the ſtomach, to promote and diffuſe a generous warmth in the extreme parts, and, if taken at night, will generally produce ſleep. Perhaps it acts upon the principle of tepid bathing; with this difference, that any action on the ſtomach has a more extenſive influence on the ſyſtem, than the ſame action would have on the ſurface of the body.

10. WATER heated to a certain degree, when taken into the ſtomach will

produce giddineſs of the head, while the ſame water, of a lower temperature, will produce no ſuch effect: this is the reaſon why patients at Bath are directed to drink the water of different ſprings, though not differently impregnated, and it gives riſe to a refinement in practice, which has for its foundation only the different effects of temperature. It is not improbable, but that more benefit will ariſe when the temperature is carried to that degree which produces ſome ſenſible effect upon the head; it is impoſſible to lay down any general rule on this ſubject; it is trial alone on the individual that can determine the point of action.

II. I CONSIDER the waters of Bath, Briſtol, and Buxton, as not having any powers ſuperior to common pump water heated to the ſame temperature. The ſteadineſs and uniformity, however, of their ſeveral temperatures entitle them to ſome preference, and render them proper to be drank by perſons whoſe ſtomachs are irritable, and impatient of their contents, and perhaps weakened in their digeſtive powers by long habits of ingurgitation and gluttony, or from intenſe application to ſtudy, accompanied with a ſedentary life.

12. In ſick headachs, which generally ariſe from bile in the ſtomach, half a pint of warm water taken at bed-time has a good effect. In all caſes where bile is ſecreted in too large a quantity, the uſe of emetics is improper; they increaſe the irritable condition of the hepatic ſyſtem, and divert the bile from the inteſtines. In almoſt all caſes where vomits are given, bile, during their action, is forced from the *duo-*

denum into the ſtomach, which would otherwiſe have been carried off by the inteſtines; indeed, the actions of nauſea and vomiting increaſe its ſecretion. In general, bile is a purgative ſufficiently ſtimulating for its own evacuation, only requiring the aſſiſtance of warm water for facilitating its diſcharge: if, however, in ſome caſes, it irritates without purging, I would recommend the uſe of ſmall doſes of the neutral ſalts, ſuch as ſoluble tartar, ſal catharticus amarus, and the like; and in all caſes they do moſt good under dilution.

13. This ſuggeſts the propriety of recommending the uſe of Cheltenham water to perſons returning from warm climates. It may be drank either with or without its chalybeate part, but at all events its doſe ſhould be ſuch as to produce a purgative effect. Per-

haps it would be more advantageous to take it every other morning than to uſe it daily: it may be ſucceſsfully and well imitated by artificial means, ſo as to be drunk at a diſtance from the ſpring with equal effect as at Cheltenham*.

14. THE ſtomach, in its energy and power, is greatly aſſiſted by warm clothing, eſpecially on the lower extremities of the body. The diet of a patient, whoſe ſtomach and bowels are extremely irritable by the exceſs and preva-

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* The beſt method of imitating Cheltenham water is by diſſolving the *ſal catharticus amarus* in a natural chalybeate water, ſuch as that of Iſlington or Tunbridge; and upon this, as on other occaſions, the natural powers of mineral waters may be frequently improved. It is upon the ſame principle, that by diſſolving the purgative ſalt of Cheltenham, previouſly procured by evaporation, in the water of the ſame ſpring from which it was ſeparated, its purgative power may be increaſed, in many caſes, with much advantage.

lence of bile, ſhould be moderate in quantity, and of eaſy digeſtion. This will neceſſarily exclude melted butter, every thing fried, every ſpecies of paſtry, together with cold and raw or unboiled vegetables. Ripe fruits may be admitted, in moderate quantities, rather before than after dinner. Water, or wine and water, may be drank for common uſe. Spirituous liquors of all kinds ſhould be avoided, as having a tendency more directly to produce diſeaſes of the liver, and to weaken the tone of the ſtomach.

15. THE CHOLERA MORBUS may very properly be conſidered under the head of thoſe diſeaſes which depend on the increaſed ſecretion of bile. It takes place, with different degrees of violence, in different habits: in ſome it is ſo acute as to prove fatal in a few hours, while

in others it is expreſſed only by a ſlight purgative and emetic operation. In general the ſymptoms are as follow.

16. THE patient is ſeized with a violent diſcharge of a dark coloured fluid, in large quantity, and ſomewhat of a bitter taſte, both from the ſtomach and inteſtines, with much pain and anxiety about the *præcordia*, together with cramps or ſpaſms, particularly of the lower extremities; there is a conſiderable degree of thirſt, the pulſe is extremely quick and weak. When the diſeaſe proves fatal, the pulſe intermits and becomes more feeble, the extremities become cold, the patient is ſeized with hiccup, and dies in the ſame manner as perſons do from inflammation of the bowels.

17. THIS diſeaſe is extremely prevalent in this country, in the months of

Auguſt and September, ſo as to be conſidered as an autumnal epidemic. It frequently takes place ſpontaneouſly, and independently of any ſenſible occaſional cauſe being applied; at other times it is evidently connected with a ſudden change of temperature in thoſe months.

18. It may likewiſe ariſe from the intemperate uſe of food of difficult digeſtion, and unripe fruits. In the autumn, the hepatic ſyſtem is more irritable in this country, than at any other ſeaſon. And the diſeaſes, which prevail in the months of Auguſt and September, are obviouſly connected with the ſtate of the biliary ſecretion, and approach in their nature to ſuch as prevail in warm climates.

19. The fluid diſcharged in the *Cholera Morbus* is evidently bilious, but it is bile in a very diſeaſed ſtate, by no

means correſponding with the character of the natural or healthy ſtate of that fluid.

20. It ſeems probable that, from the quantity ſecreted, and the rapid manner in which it is poured into the duodenum, there is not time ſufficient for a perfect ſecretion, that the fluid therefore is ſomewhat of an intermediate nature between blood and bile. Perhaps, from a hurried circulation, a conſiderable quantity of red globules eſcape, unchanged, from the capillary veſſels into the *pori biliarii*, and uniting with a portion of bile, are carried by the hepatic ducts into the duodenum.

21. The varied and increaſed action of a gland has much influence in determining the nature of the fluid ſecreted. In ſome caſes bile is diſcharged of a green colour and extremely acrid,

not poſſeſſing the qualities of healthy bile.

22. The cure of *Cholera Morbus* is beſt effected, by firſt diluting the contents of the ſtomach and inteſtines, by the plentiful uſe of warm water, water gruel, chicken broth, and the like, and afterwards by allaying irritation by opiates. In the advanced ſtage of the diſeaſe, with a weak pulſe and cold extremities, I have ſeen great advantage from the uſe of opium with aromatics, as in the *confectio opiata*, and of muſk in large doſes. Every thing which has a tendency to vomit or purge actively ſhould be avoided, but emollient glyſters may be frequently employed. If, in the firſt ſtage of the diſeaſe, ſymptoms of fever and inflammation ſhould occur, the patient may loſe a conſiderable quantity of blood, and a

large bliſter ſhould be applied to the abdomen. In ſome caſes the warm bath may be employed with advantage; it is, however, chiefly to diluents and opiates that we truſt for a cure.

23. THE ſecretion of bile is frequently increaſed and hurried by cauſes acting on the ſtomach, ſuch as ſea ſickneſs, and emetics; the diſcharge of bile by vomiting is therefore no proof of its having exiſted in the ſtomach before the exhibition of the vomit, or of its having been the primary cauſe of nauſea and indigeſtion: it is only the effect of direct action on that organ.

24. IN the bilious fever of the Weſt Indies, the nauſea and vomiting which ariſe from ſome ſlight degree of inflammation near the pylorus and upper ſurface of the duodenum, invite bile into

the ſtomach, which has no tendency to produce the fever; it is only an effect, and not the cauſe of the diſeaſe.

CHAP. II.

OF THE DIMINISHED SECRETION OF BILE.

SECT. I.

FROM what has been already obſerved on the uſe of the bile and its application to the purpoſes of the animal œconomy, it is obvious, that a conſiderable diminution of the quantity ſecreted will be followed by diſeaſe. The liver may be rendered incapable of ſecreting the uſual quantity of bile by any defect in its ſtructure; and that this is frequently the impeding cauſe, appears from diſſection.

2. It is an organ very ſuſceptible of chronic inflammation, which, without alarming in the firſt inſtance, by painful or active ſymptoms, gradually induces obſtruction, with an increaſe or diminution of its bulk, perhaps ultimately obliterating the capillary ſyſtem and pori biliarii, the more immediate ſeat of ſecretion. In ſuch caſes the patient will be ſubject to occaſional pain in the right hypochondrium, extending to the ſcapulæ, a quick pulſe, an increaſe of heat, alternating with chilly ſenſations, difficult breathing on quick motion, ſome difficulty on lying on the left ſide, flatulency, indigeſtion, acidity, coſtiveneſs, and, together with a gradual diminution of ſtrength and fleſh, the patient has a pale or ſallow complexion. Such ſymptoms are accompanied with a defect in the ſecre-

tion of bile, and a torpid ſtate of the inteſtines.

3. It is probable, that under theſe circumſtances, the original miſchief is in the ſtomach and duodenum, and that the ſympathetic action on the liver is leſs, on which perhaps healthy ſecretion may depend; hence dyſpeptic complaints generally precede affections of the liver, and ariſe from intemperance either in eating or drinking, but are more particularly induced by the abuſe of ſpirituous liquors, even though diluted with water. The ſtomach, by long faſting, has its digeſtive powers much weakened, by which the ſecretion of bile is diminiſhed, and a diſeaſed ſtructure of the organ ultimately induced. Grief and anxiety of mind firſt weaken the powers of the ſtomach, and ultimately thoſe of the liver, and thereby di-

minish ſecretion: a ſedentary life will do the ſame.

4. HYPOCHONDRIACAL complaints are always attended with ſymptoms of dyſpepſia and diminiſhed ſecretion, and great torpor of the alimentary canal. In the chloroſis of women we have likewiſe a diminution in the quantity and activity of bile.

5. WHEN the diminiſhed ſecretion is preceded by affections of the ſtomach, ſuch as loſs of appetite, indigeſtion, and flatulent eructations, the diet of the patient ſhould be attentively regulated; and the art of cookery rendered merely ſubſervient to digeſtion, and the preparation of healthy chyle. The quantity of food taken at any one time ſhould be moderate, and water ſhould be the only liquid drunk with our meals, as more effectually promoting digeſtion

than fermented liquors of any kind. All raw or unboiled vegetables ſhould be avoided; ripe fruits may be moderately taken; almoſt all boiled vegetables may be admitted. Animal food ſhould be well boiled or moderately roaſted, and taken with its own gravy. Pye-cruſt and every thing fried ſhould be excluded; butter rendered rancid by being melted ſhould be likewiſe forbid. The patient ſhould uſe moderate exerciſe, and drink ſome natural chalybeate water of a tepid heat, before breakfaſt, and perhaps in the evening. By thus giving vigour and energy to the ſtomach and duodenum; the healthy action of the liver will be reſtored.

6. THE temporary loſs of bile may be ſupplied by various bitters, occaſionally united with rhubarb, aloes, and the like. The exceſs of acidity may be cor-

rected by alkaline remedies and lime water. In infants the bile is frequently not ſufficiently active, and generally ſecreted in too ſmall a quantity, which in them induces diſeaſes of prevailing acidity.

7. In caſes of diſeaſed ſtructure of the liver producing a diminution of ſecretion, and particularly when ſuch change of ſtructure has ariſen from inflammation; mercury has been found uſeful, even carried to the degree of producing a ſlight ſalivation, moderating the violence however of its operation by plentiful dilution with gum arabic and other vegetable demulcents.

8. Sea ſickneſs and a ſea voyage contribute very much to reſtore the ſecretion of healthy bile, ſo neceſſary to the welfare of the animal œconomy; and ſymptoms of dyſpepſia and diminiſhed

ſecretion, which are now rendered more conſpicuous among females from their ſedentary life, are moſt effectually removed by the means already ſuggeſted.

9. In ſome caſes, the reſiſtance to the ſecretion of bile may ariſe from the viſcidity of the fluid obſtructing the extremities of the common duct as it enters the duodenum: this will be removed moſt effectually by calomel, ſcammony, or jalap, which ſeem in their operation to ſtimulate and evacuate the duodenum, while many other purgatives act moſt forcibly on the large inteſtines.

10. In the infantile fever of children, ſo well deſcribed by Dr. Butter, a bilious diarrhœa comes on which proves ſalutary and critical, and ſhould be encouraged by a ſolution of ſal. polychreſt.

in water, and ſometimes by the occaſional uſe of calomel and ſcammony, eſpecially in the early ſtage of the diſeaſe.

11. THERE ſeems much ſympathy between the brain and the liver; and in maniacal perſons, in whom there is generally a defect in the ſecretion of bile; this evil is beſt removed by the means already recommended.

CHAP. III.

OF OBSTRUCTION TO THE FREE PASSAGE OF BILE INTO THE DUODENUM.

SECT. I.

IF after bile is ſecreted, its free admiſſion into the duodenum be impeded, ſo that an accumulation of it take place in the excretory ducts of the liver; it either regurgitates into the habit by the hepatic veins, or is abſorbed by the lymphatic ſyſtem; in either caſe it produces the diſeaſe called JAUNDICE; the hiſtory and cure of which I ſhall now endeavour to explain.

2. JAUNDICE may be defined a yellow colour of the ſkin, and tunica conjunctiva of the eye, with urine of an obſcure red, tinging linen with a yellow hue, and with the fæces generally of a light and clay-like appearance in conſiſtence and colour.

3. THIS is a diſeaſe to which women are more ſubject than men, and adults than children; though it takes place occaſionally in perſons of all ages and of both ſexes. It is attended with a ſenſe of laſſitude and languor, a ſenſe of pain and tenſion, or weight and oppreſſion about the præcordia; there is frequently much anxiety and ſome degree of difficulty in breathing. The eyes and roots of the nails firſt become yellow, afterwards the whole body, which is alſo ſometimes

attended with an itching of the ſkin.—The diſeaſe is often accompanied with nauſea, vomiting, flatulency, acidity, and indigeſtion; and the fæces, which are commonly of a white colour, have not the uſual fæculent ſmell. Solid food generally taſtes bitter in the mouth in ſome, and in the moſt unfavourable ſtate of the diſeaſe there occurs hiccup, and occaſional paroxyſms of rigor or chillineſs. The pain is ſometimes extremely acute in the right hypochondrium, or in the epigaſtrium. The ſtate of the pulſe varies; in general it is quicker than natural, though in ſome caſes, eſpecially during the paſſage of a gall ſtone, it is ſlower. It very ſeldom or never happens, that objects appear to the patient of a yellow colour.

4. THIS diſeaſe is frequent during pregnancy, and in early infancy; in

both, however, it is of a very ſhort duration.

5. Its decline is marked by a gradual diminution of the ſenſe of weight, oppreſſion, or uneaſineſs about the præcordia; a return of appetite and digeſtion; the colour of the urine becomes more diluted; it is ſecreted in a larger quantity; the ſtools acquire a yellow colour, are more copious, and more eaſily procured; ſometimes hard and concrete matter is found in the fæces.

6. It is a diſeaſe into which a patient is very liable to relapſe. It is very unfavourable if the pain be violent, and attended with a quick pulſe, loſs both of ſtrength and fleſh, with occaſional chillineſs, watchfulneſs, and melancholy; under thoſe circumſtances he becomes ſubject either to profuſe ſweating or hæmorrhagy. When theſe ſymp-

toms attend it, the diſeaſe frequently terminates in a confirmed aſcites.

7. UNDER ſuch circumſtances we may conclude, that though ſome bile muſt be ſecreted, and that its regurgitation or abſorption is the conſequence of ſome reſiſtance to its free ingreſs into the duodenum; yet that a part of the liver is, in its ſtructure, or organization, materially diſeaſed, a circumſtance which, though frequently attendant on jaundice, is by no means neceſſary to conſtitute the diſeaſe.

8. ON diſſection, various appearances preſent themſelves to our notice. The brain, the bones, and even the cartilages, are found deeply tinged of a yellow colour. The pori biliarii, and ſome of the larger branches of the hepatic ducts, are found ſometimes obliterated by diſeaſed ſtructure. Gall ſtones are often

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found in the ductus communis, but more frequently in the gall bladder and cyſtic duct. In ſome a thickening and diſeaſed ſtructure of the ductus communis has taken place, not unlike what has been obſerved in the œſophagus or urethra. In many caſes there have been appearances of mechanical preſſure from the diſtenſion and tumour of ſurrounding and neighbouring parts, as of the pancreas, duodenum, and colon, either of a temporary or permanent nature; hence a jaundice may ariſe from preſſure during pregnancy. The bile has been found of a very viſcid, and pitchy conſiſtence, eſpecially in the gall bladder, paſſing from the cyſtic to the common duct, and thereby perhaps reſiſting the paſſage of the more fluid hepatic bile, which would otherwiſe flow freely into the duodenum.

9. The *chloroſis*, to which young women are extremely ſubject, to a ſuperficial obſerver, puts on the appearance of jaundice. In the chloroſis, the tunica conjunctiva is not more diſcoloured than any other part of the body, and the urine is not of a deep colour, but rather pale and limpid.—I am perſuaded, however, that in chlorotic habits the bile is more inſipid, is ſecreted in leſs quantity, and of a more pale colour than in health. This imperfect ſtate is, perhaps, in common to all the other ſecretions of chlorotic ſubjects, and may poſſibly ariſe from the watery ſtate of the blood, the paucity of red particles, and the defective energy of the whole ſyſtem.

10. In the endemic fever of the Weſt Indies, in which the ſkin is obviouſly tinged with bile, there ſeems rather a

redundancy of it in the primæ viæ, than a deficiency. Perhaps the quantity of bile which is ſecreted is ſo very conſiderable, that though the greateſt part of it eſcapes into the primæ viæ, the whole may not readily find a paſſage; and the ſurcharge thus occaſioned may give riſe to regurgitation and abſorption. The reaſon for this may probably be, that the diameter of the common duct, or of the larger branches of the pori biliarii, though fully adequate to tranſmit the whole of the bile ſecreted in the healthy ſtate of the liver, yet may be inſufficient to convey the exceſs produced under an hurried and imperfect action of that organ; and therefore with every appearance of a large ſupply of bile in the primæ viæ, a jaundice may take place.

11. THE ſymptoms of pyrexia, and

other phenomena of febrile miaſmata acting on the body under this diſeaſe, the delirium, the quick proſtration of ſtrength, after early ſymptoms of local inflammation, either in the duodenum, or region of the biliary ducts, diſtinguiſh it very readily from jaundice.

12. THE ſecretory œconomy of the liver in common with that of moſt other organs in the body, is very much under the dominion of the paſſions. Anger, it is well known, produces ſtrongly marked effects; it not only augments its quantity very conſiderably, but likewiſe vitiates it: hence it is, that by being carried into the duodenum in large quantities, and thence regurgitated into the ſtomach, it produces effects like thoſe of an emetic.

13. IF the ductus communis does not tranſmit it as faſt as it is ſecreted, and

the gall-bladder is ſo full that it cannot receive the exceſs; then it will be forcibly returned upon the hepatic ſyſtem, and by entering the blood veſſels produce jaundice.

14. It ſeldom happens, when a ſecretion is hurried by the exceſs of action, that the fluid ſecreted poſſeſſes its natural and healthy properties; hence ariſes the variation in appearance of bile, which, in ſome acute caſes, as in cholera morbus, I have ſeen of a colour as black as ſoot, ſo as to reſemble more the red particles of the blood, in a broken or diſeaſed ſtate, than the bile. Such a fluid may be conſidered as ſomething between blood and bile, and carried off ſo quickly, that the proceſs of making bile had only juſt begun, though the change in the condition of the blood with a view to that proceſs had taken

place. This could not have depended on any diſeaſed ſtructure, for it is inſtantly removed by opiates and other means which may reſtrain immoderate action.

15. Men engaged in literary purſuits, and women, from leading ſedentary lives, are very much diſpoſed to jaundice and other diſeaſes of the abdominal viſcera; for the excretory powers of the liver depend but little upon any action which the biliary ducts can perform, as they poſſeſs a very ſmall degree of irritability; but are aſſiſted principally from the agency of the diaphragm, abdominal muſcles, and periſtaltic motion of the inteſtines; and more eſpecially from the agitation which the hepatic ſyſtem ſuffers during bodily exerciſe. The want therefore of a degree of exerciſe ſufficient to aſſiſt the biliary ducts in their excretory function, muſt neceſſarily lay

an ample foundation for morbid affections. And the neceſſity of this external aid to the perfect action of the liver, ſeems more obvious from the circumſtances of its venous circulation, which is always more languid than in thoſe ſecretory organs, where the fluids are kept in a ſtate of more rapid motion by arterial impulſe.

16. The bile, during its ſtay in the gall bladder, acquires a viſcid conſiſtence, perhaps, in ſome meaſure, from the abſorption of its more aqueous parts, and likewiſe from a propenſity to ſpontaneous ſeparation, by which its coagulable part may detach itſelf. Though this circumſtance is leſs obvious in bile than in blood, and though it may require more time to be effected, yet I think it probable from analogy that ſuch a ſeparation of its parts may take place.

17. In many caſes we find the abuſe of ſpirituous liquors diſpoſes to jaundice, evidently of the moſt unfavourable kind; becauſe generally accompanied with diſeaſed ſtructure. They may act by firſt altering the ſtructure of the ſtomach and duodenum, and afterwards, by ſympathy of contiguity, affect the biliary ducts of the liver. In the diſſection of thoſe who have been intemperate dram-drinkers, the diſeaſed ſtructure may be traced from the ſtomach along the courſe of the ductus communis, and I have frequently ſeen theſe ducts ſo contracted and thickened, that they could not tranſmit bile*.

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* The ſtomach of dram-drinkers is generally in a flabby and inelaſtic ſtate, capable of ſecreting only diſeaſed fluids: this loſs of tone in the ſtomach is followed by frequent vomiting, tremulous motions of the muſcles, propenſity to palſy, and loſs of memory.—In many caſes, as has been already obſerved, the liver is ſo far diſeaſed

17. HOWEVER remotely ſituated ſome parts of the body may be from others; yet a diſeaſed action is quickly propagated to a diſtance, without affecting intermediate parts: and it frequently happens that an attempt to cure the diſeaſe of a part, is followed only by its removal to ſome other organ of the body; hence the ſuppreſſion of iſſues, cutaneous eruptions, and hæmorrhoids are followed in ſome caſes by morbid affections of the lungs, in others of the hepatic ſyſtem, and theſe do not always ſubſide on reſtoring the diſeaſed action to the organ firſt affected. In confirmation

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that it does not even ſecrete bile, and a pallid and unhealthy aſpect takes place.

The urine is ſecreted in a ſmall quantity, of a deep colour, though not tinging linen of a yellow hue. This is frequently a more dangerous ſtate of diſeaſe than jaundice, which indicates only a reſiſtance to the paſſage of bile into the duodenum, and may take place in the moſt healthy ſtate of the liver.

of this opinion, I have ſeen a jaundice with a ſenſe of pain and oppreſſion on the right hypochondrium, correſpond and alternate with piles, and habitual diſcharges of pus in the lower extremities.

18. It is generally admitted, and I think ſufficiently proved by ſome experiments already mentioned, that the biliary ducts are very paſſive, that they ſubmit very eaſily to mechanical diſtenſion from calculi, without contracting afterwards like ſenſible or irritable parts; therefore when jaundice has ariſen from very acrid emetics, or griping purgatives, or colic, or hyſteria, the reſiſtance to the free paſſage of bile is either at the very extremity of the ductus communis, or during its oblique courſe through the ſubſtance of the duodenum, at which part it is liable to compreſſion

from the muſcular action of that inteſtine. And perhaps, likewiſe, the increaſe of the quantity of bile in the inteſtine may depend on an action communicated to the ductus communis. In the one caſe the duct may be cloſed, in the other it may be acted upon by ſucceſſive motions, by which it emulges more quickly its contents.

19. WHEN we were treating of the natural and chemical hiſtory of the bile, we annexed ſome obſervations on the appearances and component parts of biliary calculi, which will ſuperſede the neceſſity of a repetition of them in this place. It will be proper here, however, to remark, that ſuch concretions do not occur in every part of the biliary ſyſtem with equal frequency; from diſſection it appears that they very rarely exiſt in the hepatic ducts, ſometimes

met with in the ductus communis, more frequently in the ductus cyſticus, and are moſt common in the gall bladder. The bile accompanying them is more viſcid than uſual, and appears to contain a larger portion of the colouring and bitter principles.

20. THE number and ſize of theſe calculi vary much: ſometimes the gall bladder is filled with them, at others there are not more than one or two; ſometimes they are ſmall and angular, at others large, and have a more regular ſurface. I have ſeen a gall ſtone nearly the ſize and figure of the gall bladder itſelf, ſo as nearly to fill the whole cavity. Theſe large calculi are leſs frequently the cauſe of jaundice than ſmaller ones: for, from their bulk, there is but little probability of their entering the ductus cyſticus, and afterwards of

obſtructing the ductus communis. It is from calculi of ſmaller dimenſions that ſuch obſtructions are occaſioned. However the rule is not without exceptions, and from diſſection it appears, that calculi of conſiderable bulk muſt have paſſed, for the ductus communis has been enlarged to an inch in diameter, an inſtance of which has been met with by Dr. Heberden.

21. But calculi have paſſed, during life, of ſuch a bulk as to occaſion a doubt whether they eſcaped into the inteſtines by the natural canals, or made their way thither by a preternatural paſſage. Dr. Cheſton, ſome years ago, met with a caſe where a gall ſtone of an unuſual magnitude paſſed during life and the patient got well. Some years after ſhe died of another complaint, and on examination it appeared that this large gall

ſtone had made a preternatural paſſage through the gall bladder into the inteſtine. Mr. Cline, in his excellent collection of anatomical preparations at St. Thomas's Hoſpital, has an inſtance of a caſe of this kind.

22. A PERMANENT jaundice has frequently ariſen from ſurrounding tumours compreſſing the hepatic ducts: a ſchirrous enlargement of the pancreas, has ſometimes produced this effect. Exceſſive vomiting and violent exerciſe, perhaps by forcing ſtones from the gall bladder into the cyſtic duct, and from thence into the common duct, have produced the diſeaſe. There is an inſtance where jaundice aroſe from the ſeeds of gooſeberries being found in the extremity of the ductus communis as it enters the duodenum. In ſhort, whatever can obſtruct or impede the paſſage of

the bile into the duodenum, muſt be conſidered as a cauſe ſufficient to produce jaundice: but in what way the bile paſſes from the biliary veſſels into the general circulation, has already been explained in the phyſiological part of this work.

23. The jaundice, when ariſing from a diſeaſed ſtate of the ſtructure of the liver, or from the tumour of ſurrounding parts, and more eſpecially if accompanied with fever and gradual diminution of ſtrength and fleſh, is ſeldom cured, and generally terminates in aſcites.

24. If, on the other hand, it has ariſen ſuddenly in young and vigorous habits (though accompanied even with much pain), unattended with fever, and the other unfavourable circumſtances above remarked, it is ſeldom of long

duration, and by a judicious treatment may be effectually removed.

25. THE *cure* of *jaundice* conſiſts in the removal of exciting cauſes, and in alleviating urgent ſymptoms. Calculi are the moſt frequent exciting cauſes.

26. IT appears from experiments that ſome calculi are ſoluble in an alkali, in ſpirit of wine, and oil of turpentine; but it is altogether impracticable to make a direct application of thoſe ſubſtances to calculi in the biliary ducts, as we have no facts to prove, that by the courſe of circulation, they can be carried into the gallbladder ſo little changed as to preſerve any ſenſible degree of power.

27. MANY ſaline remedies paſs into the urine unchanged, and may act on calculi in the bladder; but we cannot detect the preſence of alkaline or other ſolvents in the bile. The analogy there-

fore between the action of ſolvents in biliary and urinary calculi will not obtain.

28. The paſſage of gall ſtones may be promoted by gentle vomits, and for this purpoſe ipecacuanha may be given; but its action will be aſſiſted if it be exhibited in ſmall and divided doſes, ſo as to occaſion for a time a degree of nauſea, but ultimately to produce the full effect of an emetic. And perhaps it is on this principle that ſea-ſickneſs in thoſe caſes has been ſo very efficacious.

29. The duodenum may be ſtimulated by calomel combined with ſcammony or rhubarb, and in caſes of a defect of bile in the inteſtinal canal, the deficiency may be ſupplied with a purgative bitter, by an infuſion of camomile flowers, with tinct. aloes, or colomba, with rhubarb and ſoap, or kali vitriol. with in-

fuſ. rhei. In caſes of violent pain, with a ſlow pulſe, opiates and tepid bathing may be recommended. In caſes of pyrexia, with local pain and dyſpnœa, venæ ſectio and the antiphlogiſtic regimen may be uſed with advantage.

30. GENTLE exerciſe on horſeback is particularly uſeful in promoting the paſſage of calculi, and preventing the ſtagnation of bile in the gall-bladder, which probably renders it viſcid, and liable to obſtruct the free paſſage into the duodenum.

31. IN jaundice from tumour or preſſure of ſurrounding parts, ſmall doſes of calomel, or ſome other mercurial preparation, may be uſeful, unleſs ſymptomatic fever ſhould take place, in which caſe mercury is hurtful. Chalybeate waters may be uſed to advantage with a view of giving tone and energy to the ſyſtem, ſo very defective in caſes of jaundice.

CHAP. IV.

OF THE DISEASES TO WHICH THE LIVER IS SUBJECT IN COMMON WITH OTHER ORGANS OF A GLANDULAR STRUCTURE.

SECT. I.

THE liver is ſuſceptible both of acute and chronic inflammation; perhaps of the former, as being more immediately connected with its arterial or nutrient, the latter with its venous or ſecretory ſyſtem. When the liver is ſeized with acute inflammation the diſeaſe is called Hepatitis.

2. It is generally preceded by ſome degree of *horripulatio* and *rigor*, which in ſome caſes, however, are ſo ſlight as to evade the attention or recollection of the patient; to theſe ſucceed an increaſe of heat and quickneſs of pulſe. The pain in the right *hypochondrium*, or region of the liver, is very acute, attended with difficult and painful reſpiration, great watchfulneſs, and occaſional delirium. The patient lies with more eaſe on the right ſide. The urine is ſecreted in ſmall quantity, is high coloured, and frequently tinged with bile. The tongue is generally covered with a white cruſt, and, together with the mouth and *fauces*, is extremely dry. Theſe are the leading ſymptoms of Hepatitis.

3. The ſymptoms are ſomewhat varied, according to the particular part of the liver which may happen to be the

ſeat of the diſeaſe. If the inflammation attack the convex ſurface of the liver, ſo that the peritoneum becomes affected, the pain is much increaſed by external preſſure, and ſome degree of *tumour* may be obſerved. If that part of the organ be diſeaſed which is more immediately contiguous to the diaphragm, it gives riſe to difficult and painful reſpiration, dry and frequent cough, acute ſhooting pains in the thorax, extending to the humerus, clavicle, and ſcapula.

3. THESE ſymptoms, from the reſemblance they bear to thoſe of pleuriſy, peripneumony, and other inflammatory affections of the cheſt, are apt to miſlead an unwary practitioner; but are to be diſtinguiſhed from them by an attention to the hiſtory and progreſs of the complaint.

4. IN ſome caſes of Hepatitis the ſto-

mach is ſo extremely irritable, that violent retching or vomiting occur, ſymptoms influenced, perhaps, by the inflammation being in the vicinity of that organ. In moſt caſes the ſecretion of bile is increaſed under active inflammation, though its paſſage into the *duodenum* is frequently impeded, ſo that jaundice is no uncommon ſymptom of this diſeaſe.

5. If the ſymptoms of *fever* and local pain continue to increaſe rapidly for a few days, a ſuppuration takes place, a large quantity of pus is formed, the external tumor becomes more prominent, a fluctuation may be perceived, ſo as ſucceſsfully to direct the operation of the ſurgeon to an artificial opening by the cauſtic or the lancet. During the formation of pus frequent rigors are felt, and a ſenſe of weight and oppreſſion ſucceeds that of acute pain.

6. It frequently happens that *pus* is formed either in the vicinity of the *ducts*, or in the concave part of the liver; ſo that no external tumor can be perceived. The uſual ſymptoms of ſuppuration, however, may be obſerved in all caſes when matter is produced; and if the outlet to it be free and open by the inteſtines, the patient frequently recovers, even after being much emaciated, and under appearances extremely unpromiſing. If again, on the other hand, the pus is diſcharged either through the *diaphragm* into the cavity of the thorax, or more directly into that of the abdomen, the diſeaſe generally proves fatal.

7. With reſpect to the manner in which the diſcharge is effected in thoſe caſes where it paſſes off by the inteſtines, it muſt be clear that ſome of the branches of the hepatic duct are involv-

ed in the ſuppuration, and conſequently deſtroyed by the ulcerative proceſs.

8. We ſhould then naturally ſuſpect that the pus would inſinuate itſelf into thoſe orifices of the hepatic ducts, which ulceration had formed, and by thoſe channels make its way into the duodenum. But this explanation is not unattended with difficulty: for it muſt be recollected, that wherever ſuppuration and ulceration are going forward, there adheſion is an attendant.

9. It would be departing from the main object of this work to branch off into a digreſſive inquiry on the advantages reſulting to the machine from this connexion of inflammatory ſtages, as thoſe advantages are as much diverſified as the parts which are the ſeat of inflammation. It is in place here, however, to obſerve, that an abſceſs of the liver,

in common with other parts, has its boundaries circumſcribed by the effuſion of coagulable lymph ſo changed by paſſing through inflamed veſſels, that the parietes of that abſceſs become ſoldered into a ſolid compact maſs. Thus an abſceſs which, under contrary circumſtances, would have diffuſed itſelf to an indefinite extent, now becomes determined and circumſcribed.

10. THESE conſiderations prepare us for a change, which muſt neceſſarily be induced on the ulcerated branches of the hepatic duct; the coagulable lymph, which is every where poured out upon the internal ſurface of the abſceſs, will, in all probability, ſo obſtruct the ulcerated orifices of the biliary ducts, that no pus can make its way by them into the inteſtines.

11. NOTWITHSTANDING this, I think

it very probable that an abſceſs may point on the concave ſurface of the liver, and ſo far involve the hepatic duct, that it may ulcerate through its coats, and allow the matter to paſs into the duodenum. Whether we may be able to diſtinguiſh ſuch a caſe in the living ſubject is rather doubtful; but I ſhould ſuſpect that the diſcharge of pus by the inteſtines will be very gradual, as the opening of communication is rather ſmall.

12. PERHAPS the moſt uſual evacuation of hepatic abſceſſes by the inteſtinal canal is that where an adheſion takes place between the ſuppurating part and the inteſtines, an ulceration enſues, and the contents of the abſceſs have a ready paſſage into the inteſtines. This may happen in different parts of the inteſtinal canal, according to the

ſituation of the abſceſs. When it is ſeated at the concave part, the duodenum may be favourable for that purpoſe; but when the lower edge of the liver is the part concerned, the great arch of the colon is the uſual outlet; and in theſe caſes it is highly probable, from the ſcale of the parts concerned, that the opening of communication will be more extenſive, and the diſcharge of the matter more free*.

13. THE diſeaſes which are miſtaken for hepatitis are peripneumony, inflammation of the ſtomach, and rheumatic affections of the muſcles in the neighbouring parts.

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* This view of the complaint accords generally with that of my friend, Dr. Cheſton, who favoured the world with his thoughts on this ſubject many years ago, in his publication called Pathological Inquiries and Obſervations, a work not leſs diſtinguiſhed for accuracy of obſervation, than valuable for the judicious remarks it contains.

14. The hepatitis is leſs eaſily diſtinguiſhed from peripneumony when that part of the liver is affected which is ſeated within the falſe ribs, and where it enlarges itſelf in ſuch a direction as to make a preſſure on the diaphragm ſufficient to diminiſh the cavity of the cheſt: and it is probable likewiſe, that, from the extenſion of the inflammation into the ſubſtance of that organ, its operation as an inſtrument of reſpiration may be much impeded. Under theſe circumſtances a troubleſome cough, with difficulty of breathing, comes on; ſo that the diſeaſe aſſumes the appearance of thoracic inflammation.

15. It is more eaſily diſtinguiſhed from the inflamed condition of the ſtomach, by its not being accompanied with that extreme ſenſe of heat and pain with which that organ is affected, eſpe-

cially after taking any thing into it; nor is the debility of the ſyſtem ſo great in the inflammation of the liver as in that of the ſtomach.

16. In the caſe of muſcular pain there is little or no fever; the pain is more diffuſed, is frequently removing from place to place, and is more influenced by varying the poſture of the body: it generally alternates with rheumatic pain in one or more joints of the body.

17. When the hepatitis terminates ſpontaneouſly and favourably there is ſome evacuation by hæmorrhagy, diarrhœa, perſpiration, or a copious ſediment in the urine. In ſome caſes I have ſeen a great increaſe of bronchial ſecretion accompanying the reſolution of this diſeaſe; and it is not improbable but that a ſuperficial diſcharge of coagulable lymph may promote this reſolution,

though afterwards productive of adheſive inflammation.

18. It has frequently happened that a large abſceſs has very quickly formed, which, either by corroding the large blood veſſels, or by effuſing pus into the general cavity of the abdomen, has proved fatal.

19. Symptoms indicating the formation of matter in the ſubſtance of the liver have ſometimes ſuddenly ceaſed; ſo that a tranſlation of the diſeaſe has taken place either to ſome other organ, or pus has been quickly abſorbed, and been diſcharged by urine.

20. The period of ſuppuration varies according to the degree of inflammation, temperament of the patient, nature of the climate, ſeaſon of the year, or the means of cure which have been adopted.

21. THE ſymptoms of ſuppuration are not always, however, very obvious; the moſt ſtriking of them are, a diminution of pain, a ſenſe of pulſation, and of weight in the right hypochondrium, eſpecially when lying on the left ſide. In many caſes the fluctuation is very apparent; theſe are, frequently returning rigors, an acceſſion of fever towards the evening, with fluſhings of the countenance, a propenſity to profuſe ſweating, and other ſymptoms of hectic fever. I have ſeen ſome caſes where the pain and inflammation have ſubſided very ſuddenly, and have been ſucceeded by a low, fluttering pulſe, cold extremities, deliquium, and death: ſo that there has been reaſon to ſuſpect that this organ may, on ſome occaſions, though much leſs frequently than others, become gangrenous.

22. THE hepatitis frequently terminates in the enlarged and ſchirrous ſtate of the organ; and we may obſerve, on the inſpection of dead bodies, ſuch a variety in the appearances, as to ſuggeſt the idea of different kinds of ſchirrous affection, which will be beſt explained by attending to the progreſs of chronic inflammation in the liver, to which ſpecies it is more ſubject than to the acute. It is indeed ſufficiently evident from diſſection, that the liver is ſubject to inflammation, which did not obviouſly appear from any prevailing ſymptom before death: though perhaps a more accurate attention to circumſtances might have aſcertained the diſeaſe.

23. FROM repeated obſervation I am induced to believe that the chronic inflammation of the liver is frequently miſtaken for a dyſpeptic ſtate of the ſto-

mach. And I have ſeen many caſes of this kind, which have been ſuppoſed to ariſe from indigeſtion. The patient generally complains of pain, which he falſely attributes to the ſtomach; and its continuance is ſo ſhort, and the degree of it frequently ſo inconſiderable, that no alarm reſpecting the future health of the patient is produced. The relief obtained by eructation and diſcharge of air tends to confirm the opinion that the ſeat of the diſeaſe is in the ſtomach; but this relief may be explained on the principle of removing the diſtention of the ſtomach, and ſo taking off the preſſure of this organ from that which we believe to be the ſeat of the diſeaſe. I believe from experience that an attention to the following circumſtances will enable us with ſome certainty to diſtinguiſh the diſeaſe.

24. In thoſe caſes where the liver is affected, conſiderable pain is felt in the parts near the ſcrobiculus cordis and epigaſtric region, upon any degree of preſſure; and as the diſeaſe advances, an increaſe of heat, a quickneſs of pulſe, and other ſymptoms of fever, are obſerved, eſpecially towards night. The patient will ſometimes derive relief from bleeding at the arm, and the blood, when drawn, will put on thoſe appearances which are common to febrile complaints and diſorders of an inflammatory nature.

25. The acute inflammation of the liver is an endemic diſeaſe in warm climates, more particularly in the Eaſt Indies, and very generally terminates in ſuppuration. When the ſymptoms of active inflammation, however, have been checked, though not effectually remov-

ed, by the antiphlogiſtic practice, the diſeaſe frequently becomes chronic, and terminates in a ſchirrous induration of the organ.

26. On this ſubject much information may be obtained by obſerving the countenance of the patient, which, though not wearing the appearance of jaundice, yet has a peculiar ſallowneſs expreſſive of a morbid condition of the liver.

27. The ſymptoms or diagnoſtic characters of the two complaints are not more diſtinguiſhed by their ſymptoms than they are by the different ſtates of the liver which produce them.

28. In chronic inflammations a condition obtains in ſome degree the reverſe of the former. Inſtead of appearances which accompany and characteriſe acute and active inflammation, there are manifeſt ſigns of indolence and want of ac-

tion in the circulating ſyſtem. The colour natural to this organ in the healthy ſtate, and which appears to be imparted to it from the bile, is loſt: it aſſumes an aſh or clay-coloured hue, evidently connected with a diminiſhed ſecretion.

29. This kind of liver is obviouſly ſmaller, it undergoes a change in ſhape; the lower edge, which is naturally thin, eſpecially of the left lobe, becomes rounded and gibbous.

30. If we cut into its ſubſtance, we find uniformly a ſolid compact appearance, interſperſed with foramina, evidently the orifices of divided veſſels; but if we compare the cut ſurface of a diſeaſed liver with that of a healthy one, we obſerve a very ſenſible difference, the latter being much more porous than the former. This morbid and compact ſtate, together with the diminiſhed bulk of

this organ, lead us at firſt view to a ſuſpicion that the diminiſhed ſize may be explained on the principle of conſolidation of its ſubſtance; or, in other words, that it has gained in compactneſs what it has loſt in external bulk.

31. If this explanation were juſt and adequate, we ſhould find the liver of its natural weight; but obſervation has evinced that, together with a diminution of bulk, there is ſome degree of loſs in its weight, evidently proving that a portion of its ſolid ſubſtance has been removed, and carried into the general maſs of fluids, agreeably to a law of the abſorbent ſyſtem.

32. But I ſtrongly ſuſpect that this diminution of ſubſtance obtains in different degrees, according to the period or duration of the complaint. In the more early ſtages of ſchirroſity the liver

is not ſenſibly diminiſhed in its bulk: nay, I am perſuaded that there is at this period an increaſe both of bulk and weight, but that afterwards there is a gradual diminution of both; and this is nothing more than may be expected, when we conſider the cauſes that occaſion this diſeaſe.

33. THESE cauſes are of a nature which tend to produce a hurried and conſequently imperfect ſecretion of bile, viz. long reſidence in a warm climate, and the immoderate uſe of ardent ſpirits.

34. BUT, whatever be the remote or occaſional cauſes, it muſt be evident that the immediate cauſes can admit but of little variety. To produce an increaſed ſecretion of bile, it muſt be evident that there muſt be an increaſed action of the branches of the vena portarum, and an accelerated circulation of fluids through

thoſe branches: hence a condition of veſſels is induced, approaching in ſome reſpects to that of inflammation, with this difference, that it is an inflammation in which the vein, or ſecreting veſſel, is more concerned than the artery or nutrient veſſel.

35. THE effect of this action, eſpecially when protracted to a conſiderable extent, muſt neceſſarily be that of inducing an alteration in the ſtructure of the part—an alteration ſimilar to what obtains in other organs labouring under indolent and chronic inflammation.

36. THIS change of ſtructure, from its ſolidity and compactneſs, ſeems to depend on the effuſion of the coagulable lymph into the parenchymatous ſubſtance of the liver, with this peculiarity, that while it is in active inflammations

depoſited by arteries, it is in the chronic kind effuſed by the veins.

36. Thus we are in poſſeſſion of a cauſe which appears to offer an explanation of that diminiſhed ſecretion of bile uſually met with in ſuch caſes, where a hurried or exceſſive ſecretion was wont to prevail: but to proceed any further in this train of reaſoning would be to anticipate what we have to propoſe on the ſubject of the proximate cauſe.

37. If this poſition juſt ſtated be true, it muſt be admitted as a conſequence, that ſuch livers are not performing their full ſhare of that office in the machine to which they were deſtined by nature.

38. Now we know, by a law of the abſorbent ſyſtem, that ſuch parts as ceaſe to perform the office nature intended they ſhould do, are conſidered as uſeleſs bodies, and are fit ſubjects for the action

of theſe veſſels: hence it is that there is a greater diminution of ſubſtance in thoſe ſchirroſities which are of long ſtanding, than in ſuch as are of more recent date.

39. To inquire in what conſiſts the proximate cauſe of inflammation of the liver, is to inveſtigate what is the proximate cauſe of inflammation in general. The limits preſcribed to this work do not allow us to enter extenſively into this queſtion, as it would involve an examination of the prevailing theories on this ſubject.

40. From obſervation we are taught the means that are uſed with advantage to palliate and even to remove inflammation; and from obſervation likewiſe we learn, that the ſame means which are ſerviceable in one inflammation are injurious in another: now, admitting

the axiom, "that ſimilar cauſes produce ſimilar effects under ſimilar circumſtances," and finding likewiſe that ſome inflammations are aggravated by the very means which cure others; we infer as a conſequence, that the condition of inflamed veſſels, or, in other words, the proximate cauſe of thoſe ſymptoms denominated inflammation, is not always the ſame. Hence ariſes a conſiderable ſhare of the difficulty attending the inveſtigation of proximate cauſes in general.

41. THE phenomena of inflammation evidently ſhew, that in every inflamed part there is a congeſtion of blood in a greater or leſs degree. This is very conſpicuous in thoſe parts of the body where, from their ſituation, we are enabled to ſee the change of colour, as in the ſkin; but more eſpecially the tunica

conjunctiva of the eye, where, from its tranſparency, and the white ſubjacent tunica albuginea, we have an opportunity of ſeeing clearly the commencement and progreſs of inflammation.

42. The firſt appearance is a diſtention of ſome of its veſſels in ſuch a degree, as to allow red blood to paſs where ſerum only was wont to circulate. In the progreſs of inflammation more veſſels become diſtended, until at length the whole eye aſſumes almoſt one uniform red appearance.

43. Now, on what peculiar ſtate of veſſels does this diſtention depend? Are the powers that act in propelling the blood from the larger veſſels to the ſmaller ones increaſed, while the reſiſting powers of the ultimate branches remain the ſame as in health? Or have the ultimate branches undergone a change

of ſuch a nature as to yield to the ordinary force or natural vis a tergo of the larger veſſels?

44. THERE are good reaſons for believing that each of theſe conditions exiſts in its turn: at leaſt the methods employed with ſucceſs to remove inflammations of this part lead to that opinion. For it is a fact well eſtabliſhed in the treatment of theſe complaints, that the ſame means which are employed in the cure of one opthalmia tend only to aggravate another. The means generally employed in theſe caſes are ſuch as either diminiſh action or increaſe tone; and each plan of treatment is ſucceſsful in its proper caſe.

45. Now what has been ſaid of opthalmia will apply to hepatitis and other inflammations.

The liver may be inflamed in conſequence of external injury. In ſuch caſes it is probable that a violent and ſtrong action will take place, analogous to what would happen in the eye from the preſence of an extraneous body; and that a plan of treatment evidently ſedative or antiphlogiſtic is moſt likely to be efficacious in both.

46. On the other hand, the ſame organs may be in a ſtate of inflammation without the application of any obvious ſtimulating cauſe. In the eye, experience has evinced that this kind of opthalmia is moſt ſucceſsfully treated by bark, and ſuch external applications as tend to ſtimulate and give tone; evidently ſhowing that the eſſential character of that inflammation is debility. And further, it is now well underſtood that an inflammation of the eye, which was of the active kind at its commencement,

changes in its progreſs to a ſtate of debility, and yields only to thoſe means that give tone and ſtrength to the part.

47. It is of importance to our ſubject to inveſtigate in what way an active inflammation degenerates into an indolent one.

We have ſaid, in every inflammation there is ſome degree of congeſtion of blood, and conſequently diſtention of veſſels: if this congeſtion be relieved at its commencement, by leſſening the diſtending cauſe, the veſſels, ſtill preſerving their tone, readily return to their original dimenſions: but if, on the other hand, the congeſtion is allowed to remain, and of courſe the diſtention of the veſſels, their tonic power neceſſarily becomes diminiſhed, and ſuch means only can avail as tend to leſſen the column of the blood, and increaſe the contractile power of its veſſels.

Theſe reaſonings may ſerve to give ſome idea of the two ſtates of the veſſels as connected with active and indolent inflammation.

48. As the principles laid down apply to inflammations of any organ, we ſhall endeavour to ſhow, by conſidering the nature of remote cauſes, in what way they may produce this ſtate of veſſels in hepatitis.

49. Many cauſes may be enumerated as remote agents in hepatitis, ſuch as affections of the mind, particularly anger, long protracted ſummer heat, the intemperate uſe of ſpirituous liquors, &c. But to produce the ſame diſeaſe it is natural to expect that there is one principle of action in common to them all. This principle appears to conſiſt in in-

ducing a ſtate of excitement in the circulation of the liver—the accelerated, though imperfect, ſecretion of bile, together with the ſenſe of fulneſs in the region of the liver antecedent to inflammation, tend to perſuade us that hepatitis is generally uſhered in by ſymptoms of exiſting congeſtion.

50. If proper methods be taken to relieve this congeſtion on its firſt attack, ſuch as diminiſhing the column of blood, or inducing a determination of it to contiguous parts, the tone of the veſſels will be preſerved, and evident inflammation prevented. Or even if an obvious inflammation has commenced, the ſame means will be equally ſerviceable by allowing the diſtended veſſels to recover that tone they were beginning to loſe. But if the congeſtion has been of ſome duration, and the tonic ſtate of the veſ-

ſels conſiderably impaired, if the moſt active means are not employed, the conſequence will be either a ſuppuration, if the inflammation be violent, or a degeneracy into ſchirrus, if the inflammation has been moderate: and it is in this way, I conceive, that an inflammation of the liver, which was of the active kind at its commencement, changes in its progreſs into a ſtate of ſchirroſity.

51. Or, a ſtate of ſchirrous may be gradually induced on the liver, without any pre-exiſting active inflammation, as happens after a long reſidence in a warm climate, where, from frequent accelerated ſecretion of bile, the hepatic veſſels, but more eſpecially the branches of the vena portarum, become ſo relaxed, that they effuſe into the parenchymatous ſubſtance of the liver that ſolid matter, which appears to be nothing

more than the coagulable lymph of the blood changed in a peculiar way.

52. BUT there is an appearance ſometimes met with on diſſection that is perhaps a little difficult to explain on this ſyſtem of reaſoning—this is a tubercular ſtate of the ſubſtance of this organ, conſiſting of a ſeries of circumſcribed inflammations, interſperſed through the apparent healthy ſubſtance of it. Now it may ſeem a little difficult to underſtand how an accelerated circulation through the whole ſubſtance of the liver can produce effects ſo partial and circumſcribed. But the difficulty is no greater in this caſe than in any other of local inflammation. Do we not ſee continually inſtances of circumſcribed inflammations and abſceſſes where the ſtate of the circumjacent parts is natural and healthy? Such phænomena do not tend

to diſprove the principles we wiſh to eſtabliſh, but ſhew that the diſeaſed condition of veſſels we have before pointed at, may exiſt in a number of ſmall parts of any organ, while the greater part of its bulk ſhall be in a natural ſtate; or that there may exiſt a conſiderable number of ſtimulating cauſes in the ſubſtance of the liver, each having its own ſphere of action, and each limited to a determined extent.

53. THE explanation juſt given is not offered as the mere ſuggeſtion of theory, but admits of a degree of probability approaching to demonſtration. This laſt opinion ſeems ſtrongly ſupported by the reſult of an experiment that was made for the purpoſe of inveſtigating a point in phyſiology, not connected with the preſent queſtion.

EXPERIMENT.

54. Two drachms of crude mercury were injected by means of a proper apparatus into the crural vein of a dog. It produced no effects that were obvious for at leaſt a whole day; but afterwards there were evident marks of increaſed action in the vaſcular ſyſtem, attended with a quick and hard pulſe. After he had continued in this ſtate two or three days, a dyſpnœa ſupervened; this was ſoon followed by a cough, and ſymptoms evidently denoting an affection of the lungs, which daily increaſed until he died. His lungs on examination were found in a tubercular ſtate; many of theſe tubercles had ſuppurated and formed vomicæ.

55. The queſtion here is, whether theſe tubercles and vomicæ aroſe from the introduction of the mercury?

The anſwer is very clear. The animal was in perfect health before. This is only a preſumptive evidence. But a minute examination of the tubercles put the matter out of doubt; for on making ſections into the ſubſtance of them, each contained a globule of mercury, forming a kind of nucleus to the circumſcribed inflammation or tubercle. Whether theſe mercurial globules acted on the principle of ſimple ſtimuli, or in a ſpecific way, is not a ſubject for our preſent inveſtigation: but the inference intended to be drawn is, that ſymptoms of general excitement may exiſt in the whole body, and that only a particular organ may ſhow marks of diſeaſe; and further, that the circulation may be accelerated through the whole vaſcular ſyſtem of a particular organ, while only particular parts of that organ ſuffer a viſible alteration in their ſtructure.

56. Now it is natural to refer theſe appearances to ſome local cauſe, but which is not always as evident as in the experiment juſt recited. This cauſe may likewiſe conſiſt in local alterations in the tone of the veſſels in particular parts of an organ; and that, in conſequence of an accelerated circulation through its whole ſubſtance, theſe debilitated parts may readily fall into a ſtate of chronic inflammation.

57. In conſidering the active and indolent inflammations of the liver, we have referred the former to the hepatic artery or nutrient veſſel; while the latter has been conſidered as an affection of its ſecretory veſſel. As this opinion is not taken up on the ground of mere conjecture, it will not be out of place

to aſſign a reaſon for having adopted it.

58. When we ſtate that chronic inflammations of the liver appear to be connected with its ſecretory office, we do not mean to reſt the explanation on any thing ſpecific in its ſecretory energy, but on its peculiarity of having the ſecretion effected from venous blood inſtead of arterial.

59. It is a fact well eſtabliſhed in phyſiology, that the living power or energy of any organ is, cæteris paribus, in proportion to the quantity of arterial blood that circulates through it. There is ſomething then in the condition of arterial blood that fits an organ for active and vigorous purpoſes; the proofs of this poſition are ſo numerous, that they muſt occur to every one. Now when we recollect that by far the greater

portion of blood that paſſes through the liver is of the venous kind, and when it is remembered likewiſe that this blood is leſs fitted to active purpoſes than arterial, there will appear ſufficient grounds for believing that chronic inflammations of the liver are to be referred to the vena portarum; while thoſe of the active kind are imputable to the hepatic artery.

60. In the active and acute inflammation of the liver, as well as that of other organs, the antiphlogiſtic practice ſhould be adopted; and as the attention of the practitioner ſhould be directed to the prevention of ſuppuration, he muſt be guided by the circumſtances of each individual caſe in forming his judgment to what extent that practice may be purſued. Here much depends on his diſcernment, as well reſpecting the extent

of the antiphlogiſtic practice, as in determining the preciſe period when it is likely to be moſt uſeful: for it muſt be obvious, that if any conſiderable advantage is to be expected from this practice, it muſt be looked for in an early ſtage of the diſeaſe, when the inflammation has not advanced beyond the probability of reſolution.

61. THE more prominent part of the antiphlogiſtic treatment is blood-letting: the quantity of blood to be taken away, together with the propriety of repeating that operation, can be judged of only by the violence of ſymptoms, by the effect upon the pulſe, and by the circumſtances of each individual caſe.

62. BLISTERS applied to the region of the liver co-operate very ſtrongly with the views of blood-letting, and therefore, in attempting reſolution, recourſe

ſhould be had to them very early; and here again the ſame diſcrimination is neceſſary with reſpect to their duration and repetition, as was required in the caſe of blood-letting. It has been advanced by ſome, and experiment appears to have juſtified the poſition, that a quick ſucceſſion of bliſters to the vicinity of an inflamed organ prevails more over the activity of inflammation, than the long protracted diſcharges from a ſingle veſication. My own experience having abundantly confirmed the truth of this doctrine, I cannot recommend it to the practitioner in too ſtrong terms.

63. As ſubſervient to the intention of reſolution, medicines promoting alvine evacuations are highly expedient; for this purpoſe, thoſe which are of a ſaline nature appear to me to claim a preference, and perhaps it is adding not a lit-

tle to their efficacy to exhibit them in a diluted form, in which ſtate they not only ſeem to be more ſtrictly antiphlogiſtic, but are leſs liable to occaſion nauſea and other diſagreeable ſenſations in the ſtomach.

64. In blood-letting, bliſters and laxative medicines appear to conſiſt the more eſſential parts of antiphlogiſtic practice; but there are other reſources of which we can avail ourſelves, and which, though ſubordinate in point of activity, are found from practice to be very efficacious as auxiliaries. Under this head we may rank antimonials exhibited in ſuch doſes as may tend to produce and continue a degree of ſoftneſs and moiſture upon the ſkin; and this operation of antimonials is much aided by a free and plentiful uſe of diluting liquors, of which there is an endleſs variety.

65. By the means above recited, the practitioner, if called in at the commencement of the diſeaſe, will generally be able to check every tendency to the ſuppurative proceſs.

66. In warm climates, more eſpecially in the Eaſt Indies, where hepatitis may be regarded as the endemia of the country, the tendency to run on into the ſuppuratory proceſs is ſo great as ſcarcely to be reſiſted even by the moſt active practice; therefore, if an early and vigorous purſuit of the antiphlogiſtic plan of treatment be neceſſary in this country, where the courſe of the diſeaſe is comparatively moderate; the extenſion of ſuch treatment to the utmoſt limits of prudence, becomes expedient, if we would oppoſe with ſucceſs the rapidity of its progreſs.

67. If, either from an unuſual vio-

lence of the diſeaſe, the too late application for medical aſſiſtance, or the unavailing efforts of the antiphlogiſtic plan of treatment, the inflammation ſhall have proceeded to the ſuppurative ſtage, different phænomena occur, according to the particular part of the liver in which the ſuppuration is ſeated. Theſe phænomena are ſuch as ariſe out of the laws which regulate the opening of abſceſſes: for the operation of nature in this reſpect, as well as in moſt others, is regular and uniform.

68. From obſervation we learn, that hepatic abſceſſes ſometimes open ſpontaneouſly into the inteſtinal canal in the manner explained at ſome length in a former part of this work; at others, they make their way through the diaphragm into the air cells of the lungs, from whence the matter is diſcharged by ex-

pectoration; or an adheſion takes place between the anterior ſurface of the liver and the parietes of the abdomen, allowing the pus to make its eſcape by the common integuments.

69. Each of theſe channels of diſcharge is determined very much by the particular ſeat of the abſceſs. When the poſterior or concave ſurface is concerned, the matter uſually paſſes off by ſome part of the inteſtinal canal, frequently the duodenum; but when it is ſeated towards the inferior edge, the colon offers a ready outlet. When the ſuperior portion ſuppurates, the air cells of the lungs favour the eſcape; and ſuch abſceſſes as form towards the anterior ſurface, uſually extend themſelves to the integuments, through which they either diſcharge their contents ſpontaneouſly, or by the aid of chirurgical means.

70. THE intention of nature in relieving herſelf by theſe different channels is the ſame, as ſhe is guided by one common principle in each of them, viz. that of availing herſelf of the neareſt outlet. But experience has evinced that theſe are not all equally favourable to her ultimate views; and ſome hepatic abſceſſes, which have been diſcharged by the lungs, appear to have produced their fatal effects more from an extenſion of ſuch abſceſſes into the ſubſtance of theſe organs, than from any derangement the conſtitution had ſuſtained from the affection of the liver. I feel myſelf warranted the more in maintaining this idea, not only from having repeatedly ſeen the ſymptoms of hepatitis, in its latter ſtage, evidently transformed into the characters of peripneumony; but from having aſcertained, by examina-

tion after death, that a ſuppurative ſurface, which originated in the liver, extended itſelf into the ſubſtance of the lungs in ſuch degree, as clearly to explain the cauſe of the peripneumonic ſymptoms.

71. THE diſcharge of hepatic abſceſſes, either by the inteſtines or the abdominal ſurface, is much preferable, as in the firſt, the organ, though important and even vital, is affected only to a ſmall extent; and in the laſt, very little danger can ariſe from an opening of a moderate ſize. What occaſions our ſurpriſe is, that they ſo ſeldom effuſe their contents into the cavity of the abdomen. The law itſelf is wonderful, though the means by which nature carries her intentions into effect are very obvious; for in all theſe caſes the opening is ſurrounded by adheſions ſo ef-

fectually, that there is little danger of the general cavity being expoſed.

72. IF, however, the diſeaſe is well marked, and the abſceſs has pointed to a determined part of the integuments, we need not wait for a ſpontaneous opening, but by means of a lancet may diſcharge the matter. Such abſceſſes are ſeldom in haſte to heal, nor is it deſirable, until the cavity of the abſceſs ſhall have been filled up by healthy granulations. During this proceſs, which is ſometimes tedious, the health gradually returns; and I have had experience of caſes where the diſcharge accompanying this granulating operation was continued for years, during which time the health was in a progreſſive ſtate of amendment, and at length was perfectly eſtabliſhed.

73. SUCH inſtances, though ſurpriſ-

ing, are not myſterious, for a part only of the liver has been concerned in the abſceſs. During the period of active inflammation, the conſtitution partook of the effects, perhaps, more from a principle of ſympathy with the inflamed organ, than from any derangement in its economy as a gland; and therefore it is natural to expect, that, as the inflammatory ſymptoms ſubſided, the ſigns of health ſhould return.

74. An opinion has for ſome time prevailed, that mercury is a ſpecific in every diſeaſe of the liver; and that even in active phlegmonous inflammations it will obviate ſuppuration. This opinion appears to have been founded on an idea, that there is ſomething very peculiar in the inflammation of the liver that is not met with in any other organ.

75. It is true, that in conſidering its

glandular office, it affords an exception to the law of glands, in having its ſecretion performed from venous blood; and this we have already conſidered as having a connexion with chronic inflammation, which experience has ſhown to be relievable by mercury. The ſucceſs in theſe caſes has perhaps led to an empirical practice, and due diſcrimination may not always have been made between inflammations of a more indolent, and ſuch as are of a more active nature.

76. To exhibit a remedy without due diſcrimination is to abuſe it, and at length to bring it into neglect; and in this way the world has been deprived, for a time, of the benefit of ſome of the moſt valuable articles of the materia medica, which however have been reſtored to them afterwards, on the recommendation of men of candour and ability, af-

ter having determined their true value by repeated and judicious exhibition.

77. PERHAPS the ſame fate may await the uſe of mercury in complaints of the liver, if, by a blind empirical adminiſtration of it, it be incautiouſly employed in the active periods of inflammation, when, from its ſtimulant properties, it appears better calculated to accelerate, than to retard the ſuppurative proceſs.

78. IT is very probable that the attachment of the practitioners in warm climates to the early uſe of mercury may have ariſen in part from the great debility conſequent on the previous excitement of the ſyſtem, which debility is ſuppoſed to prevail the moſt, where there had been much evacuation; and this prejudice has perhaps been carried to a dangerous extreme. But there are not wanting ſome, who are perfectly aware

of the neceſſity of proper diſtinctions, and who pay due regard to them in their practice.

79. In the Eaſt Indies, where this complaint is endemic, I am informed, on the beſt authority, that the moſt judicious and ſucceſsful practitioners never adminiſter mercury until the violence of the inflammatory action has been ſubdued by bleeding, and the antiphlogiſtic plan of treatment. Then it is, that mercury is employed to the greateſt advantage; for it appears, on attentive obſervation, that the tranſition of active inflammation into a ſtate of reſolution, is not immediately followed by a healthy condition of the part, but it remains for a time debilitated and diſpoſed to lapſe into a chronic ſtate. This is the proper period for the exhibition of mercury, which acts as a ſpur on the

vaſcular ſyſtem of this organ, and by its moderately ſtimulating effects, occaſions a degree of action, which, when protracted to a proper length, terminates in health.

80. BUT the diſpoſition of hepatitis to terminate in a ſchirrous and diſeaſed ſtructure, either of the whole, or of a part of the liver, is ſo ſtrong in ſome caſes, as not to be reſiſted by a moderate mercurial action. Here we are to take the advantage of its more active operations; and, inſtead of inducing a ſlight change upon the pulſe, with only a tenderneſs of the mouth, we ought to extend its effects to the production of a gentle ſalivation, which, when continued for a length of time, generally effects a cure.

81. IN the exhibition of mercury for this purpoſe, a preference has been given

to friction; and the part, on which the mercurial ointment has been rubbed, is the right hypochondrium, from a notion of its efficacy being greater when applied to the vicinity of the diſeaſed organ, than to a diſtant part. But my opinion is, that there is no material advantage derived from this; and it is of little importance, what part is made choice of, provided, the effects produced on the general ſyſtem are equally ſtrong.

82. BESIDES the ſchirroſity, which we have been conſidering as the remains of hepatitis, it is often very intimately connected with other diſeaſes; and is thought, by men of obſervation and experience, to ſtand in relation to them, as a cauſe. Thus in India, the fever and dyſentery, which are conſidered as the endemiæ of the country, have been found on diſſection to be accompa-

nied with diſeaſes of the liver. In ſome inſtances, the whole ſubſtance has been in a ſchirrous ſtate; in others, abſceſſes and the uſual appearances of hepatitis have been met with: the fact is certain, though the relation in which they are placed to each other may be matter of opinion.

83. If it be true, and there can be but little room for doubt, that every diſeaſe of a gland muſt affect, in ſome degree or other, its ſecretory powers, we may admit, that the biliary ſecretion may become extremely vitiated, may acquire acrid properties, and may morbidly affect the inteſtinal canal by its paſſage through it; hence may follow ulcerations of the internal ſurface, giving riſe to the common ſymptoms of dyſentery. But if it be an eſtabliſhed fact, as has been aſſerted by high authority, that the

dyſentery is always contagious, there would ſeem to be a neceſſity for calling in ſome other principle of action, in addition to the acrimony of the bile. But waving this controverſy, which cannot be protracted to a greater length, without evidently digreſſing from the main purpoſe of this chapter, it is in place here to obſerve, that theſe dyſenteries are ſo far congenial to the hepatic affections with which they are combined, that they are generally relieved by mercury adminiſtered under the cautions we have already laid down.

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